



George Latimer, Westchester County Executive

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

TITLE

**MAIN HOUSE RENOVATION
LASDON PARK, ARBORETUM AND VETERANS MEMORIAL
SOMERS, NEW YORK**

**Contract No. 16-529
Bid Opening: January 20, 2021**

By Bidder (Please Print)

Firm/Business Name: _____

Address: _____

For Official Use Only

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

PRE-BID SITE INSPECTION

- A. Superseding the first paragraph of Article “Pre-Bid Site Inspection” of the Information for Bidders, bidders will be permitted to examine the work site at either of the following Open House sessions:
- From 10:00 a.m. to 1:00 p.m. on Wednesday, December 16, 2020, at the Lasdon Park Main House, Somers, New York
 - From 10:00 a.m. to 1:00 p.m. on Thursday, December 17, 2020, at the Lasdon Park Main House, Somers, New York
- B. In order to be allowed to participate in the Pre-Bid Site Inspection Open House sessions all attendees must wear masks and shall observe six foot social distancing standards at all times. Attendees are to follow the directions of the Lasdon Park staff at all times.
- C. For questions regarding the Pre-Bid Site Inspection Open House sessions the bidders should contact James Antonaccio, Department of Public Works and Transportation, Division of Engineering at (914) 995-6343.
- D. All other portions of Article “3. PRE-BID SITE INSPECTION” of the Information for Bidders shall remain in full force and effect.

REQUESTS FOR INFORMATION

- A. All requests for information shall be directed in writing to Steve La Rocca, R.A. at La Rocca Greene Architects, slarocca@laroccagreene.com with a copy to James Antonaccio, JPA4@westchestergov.com no later than 1:00 P.M. on Tuesday, January 5, 2021.

SPECIAL NOTICE

County of Westchester
New York

ALTERNATES

This contract consists of the Base Bid and three Add Alternates as defined in the Specifications and on the Drawings.

It is the goal of the County to award the Base Bid and the alternates if the low bid for all items are within the amount budgeted for this project. If the Base Bid and Alternates exceed the amount budgeted for this project, the contract will be awarded to the bidder as per Proposal Page 6.

ALTERNATE 1:

For providing all labor, material and equipment necessary to complete all work as shown on the contract drawings and in accordance with the specifications for provision and installation of one diesel fueled emergency generator

ALTERNATE 2:

For providing all labor, material and equipment necessary to complete all work as shown on the contract drawings and in accordance with the specifications for rehabilitation of the North Driveway

ALTERNATE 3:

For providing all labor, material and equipment necessary to complete all work as shown on the contract drawings and in accordance with the specifications for the replacement of the exterior ramp, railings, stairs, door and storage room at the north end of the building

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 <https://business.westchestergov.com/mwbe> 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 shall 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 shall 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

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.

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.

NOTICE TO CONTRACTORS

County of Westchester
New York

Sealed proposals for the following construction work:

CONTRACT NO: 16-529

ADVERTISING: **December 2, 2020**

PRE-BID INSPECTIONS: **December 16, 2020**

and December 17, 2020

MAIN HOUSE RENOVATION LASDON PARK, ARBORETUM AND VETERANS MEMORIAL SOMERS, 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, January 20, 2021**, and immediately thereafter and in accordance with Executive Order 202-11 issued by Governor Cuomo on March 27, 2020, the bids will be opened and recorded in a proceeding that is accessible to the public via the livestreaming service WebEx. 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** 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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23 82 36	4	Convectors
23 82 39.13	8	Cabinet Unit Heaters
23 82 39.16	5	Propeller Unit Heaters
23 41 00	10	Particulate Air Filtration
23 64 23.21	5	Air Cooled Modular Chiller Split System
23 82 19	8	Fan Coil Units

DIVISION #25 – INTERGRATED AUTOMATION – NOT USED

DIVISION #26 – ELECTRICAL

26 05 19	6	Low Voltage Electrical Power Conductors and Cables
26 05 26	7	Grounding and Bonding for Electrical Systems
26 05 29	6	Hangers and Supports for Electrical Systems
26 05 33	13	Raceways and Boxes for Electrical Systems
26 05 43	11	Underground Ducts and Raceways for Electrical Systems

November 6, 2020
Contract No. 16-529

Main House Renovations Lasdon Park
Arboretum and Veterans Memorial

26 05 44	4	Sleeves and Sleeve Seals for Electrical Raceways and Cabling
26 05 53	10	Identification for Electrical Systems
26 24 16	10	Panelboards
26 27 26	8	Wiring Devices
26 28 13	3	Fuses
26 28 16	5	Enclosed Switches and Circuit Breakers
26 32 13	20	Engine Generators
26 36 00	9	Transfer Switches
26 41 13	4	Lightning Protection for Structures
26 41 19	8	LED Interior Lighting
26 52 19	3	Emergency and Exit Lighting

DIVISION #31 – EARTHWORK

31 20 00	9	Earth Moving
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DIVISION #32 – EXTERIOR IMPROVEMENTS

32 12 16	7	Asphalt Paving
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DIVISION #33 – UTILITIES – NOT USED

END OF TABLE OF CONTENTS



1. GENERAL REQUIREMENTS AND PROPOSALS

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

Division of Engineering

GENERAL REQUIREMENTS

1. DESCRIPTION OF THE WORK

Work under this Contract includes all necessary labor, materials and equipment required for: Interior and exterior renovations and site improvements. The project also includes all associated electrical, HVAC and plumbing work.

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.

GENERAL REQUIREMENTS

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 270 consecutive calendar days computed from the date of such Notice to commence.

GENERAL REQUIREMENTS

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.

GENERAL REQUIREMENTS

- 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.

GENERAL REQUIREMENTS

- 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

6. ITEM W851 - TESTING OF MATERIALS AND FIELD TESTING EQUIPMENT

DESCRIPTION:

Under this item the Contractor shall include in their bid the sum printed in the Proposal opposite this item for testing and inspection fees and costs and for the purchase of field testing equipment.

Contract items shall be tested and inspected as per the item specification in such amounts as directed by the Engineer. The laboratories and arrangements for this testing shall be made by the Engineer only.

Field testing equipment, as needed, shall be purchased for the Engineer's use according to his direction. The equipment shall remain the property of the County.

The Contractor shall submit all bills and vouchers for testing and inspection services and costs and testing equipment to the Engineer for audit and approval before payment. After payment, a receipted copy of each bill or voucher shall be returned to the Engineer. All bids shall be paid within 30 days after their approval by the Engineer.

Bills not paid within 30 days will be paid by the County and the amounts of such payments shall be deducted from the Contractor's estimates together with a collection charge of 3% of the amounts so paid by the County.

METHOD OF MEASUREMENT:

The dollar-cents amount set forth in the proposal is a fixed price for all bidders and shall not be changed. If the amount is altered, the new figure will be disregarded and the original amount used to determine the total amount bid for the contract.

PAYMENT:

The amount paid the Contractor under this item shall be the actual total amount of the bills and vouchers approved by the Engineer for testing and inspection of materials and purchase of field testing equipment and an additional five percent (5%) for administrative costs.

The amount printed on the Proposal appears for purpose of canvas. Any bid other than the specified amount will be considered informal. The actual amount spent may be more or less than the amount stipulated in the Proposal.

GENERAL REQUIREMENTS

CONTRACT DRAWINGS:

CONTRACT NUMBER 16-529

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.

<u>DRAWING NO.</u>	<u>TITLE</u>	<u>SHEET NO.</u>
91-05-T-75-0	Title Sheet, Drawing List	T-1
91-05-G-76-0	Abbreviations, Symbols, Code and Energy Compliance	T-2
91-05-S-77-0	Site Plan	S1
91-05-S-78-0	Site Details	S2
91-05-G-79-0	Cellar Demolition & Abatement Plan	D1
91-05-G-80-0	First Floor Demolition Plan	D2
91-05-G-81-0	Second Floor Demolition Plan	D3
91-05-G-82-0	Third Floor Demolition Plan	D4
91-05-G-83-0	Roof Demolition & Abatement Plan	D5
91-05-G-84-0	West Elevation Demolition & Abatement	D6
91-05-G-85-0	East Elevation Demolition & Abatement	D7
91-05-G-86-0	North & South Elevations Demolition & Abatement	D8
91-05-A-87-0	Cellar Floor Plan	A1
91-05-A-88-0	First Floor Plan	A2
91-05-A-89-0	Second Floor Plan	A3
91-05-A-90-0	Third Floor Plan	A4
91-05-A-91-0	Roof Plan	A5
91-05-A-92-0	West Elevation	A6
91-05-A-93-0	East Elevation	A7
91-05-A-94-0	North & South Elevations	A8
91-05-A-95-0	North Service Area Plans, Elevations, Sections	A9
91-05-A-96-0	Kitchen Plan	A10
91-05-A-97-0	Kitchen Elevations	A11
91-05-A-98-0	Window Schedule, Notes & Window Elevations	A12
91-05-A-99-0	Window Details	A13
91-05-A-100-0	Door Schedule & Details	A14
91-05-A-101-0	FCU Enclosure Details	A15
91-05-A-102-0	Pantry Details	A16

Contract Drawings 1

GENERAL REQUIREMENTS

91-05-A-103-0	Miscellaneous Details	A17
91-05-A-104-0	Railing Details	A18
91-05-A-105-0	Finish Schedule	A19
91-05-A-106-0	Roof Plan With Detail Keys	A20
91-05-A-107-0	Roof Details	A21
91-05-A-108-0	Roof Details	A22
91-05-A-109-0	Roof Details	A23
91-05-A-110-0	Roof Details	A24
91-05-A-111-0	Roof Details	A25
91-05-A-112-0	Roof Details	A26
91-05-M-113-0	Mechanical Symbols Abbreviations and General Notes	M0.1
91-05-M-114-0	Mechanical Cellar Level New Work Plan	M2.1
91-05-M-115-0	Mechanical First Floor New Work Plan	M2.2
91-05-M-116-0	Mechanical Second Floor New Work Plan	M2.3
91-05-M-117-0	Mechanical Third Floor New Work Plan	M2.4
91-05-M-118-0	Mechanical Schedules and Equipment Notes	M6.1
91-05-M-119-0	Mechanical Details	M7.1
91-05-M-120-0	Mechanical Details	M7.2
91-05-M-121-0	Mechanical Risers	M7.3
91-05-P-122-0	Plumbing Symbols, Abbreviations & General Notes	P0.1
91-05-P-123-0	Plumbing Site Plan New Work	P2.0
91-05-P-124-0	Plumbing Cellar Level New Work	P2.1
91-05-P-125-0	Plumbing First Floor New Work Plan	P2.2
91-05-P-126-0	Plumbing Second Floor New Work Plan	P2.3
91-05-P-127-0	Plumbing Third Floor New Work Plan	P2.4
91-05-P-128-0	Plumbing Details	P7.1
91-05-E-129-0	Electrical Symbols, Abbreviations, Definitions of Terms	E0.1
91-05-E-130-0	Electrical Demolition Site Plan	E1.1
91-05-E-131-0	Electrical Demolition Cellar Plan	E1.2
91-05-E-132-0	Electrical Demolition First Floor Plan	E1.3
91-05-E-133-0	Electrical Demolition Second Floor Plan	E1.4
91-05-E-134-0	Electrical Demolition Third Floor Plan	E1.5
91-05-E-135-0	Electrical Site Plan	E2.1
91-05-E-136-0	Electrical Site Plan Add Alt	E2.1A
91-05-E-137-0	Electrical Cellar Plan	E2.2
91-05-E-138-0	Electrical First Floor Plan	E2.3
91-05-E-139-0	Electrical Second Floor Plan	E2.4
91-05-E-140-0	Electrical Third Floor Plan	E2.5
91-05-E-141-0	Electrical Roof Plan/Lighting Protection System Replacement	E2.6
91-05-E-142-0	Electrical One-Line Diagram	E5.1
91-05-E-143-0	Electrical One-Line Diagram Add Alt	E5.1A
91-05-E-144-0	Electrical Panel Schedules	E6.1
91-05-E-145-0	Electrical Details	E7.1
91-05-E-146-0	Captiveaire Hood & Fire Suppression	K1

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



George Latimer, Westchester County Executive

PROPOSAL PAGES

TITLE

**MAIN HOUSE RENOVATION
LASDON PARK, ARBORETUM AND VETERANS MEMORIAL
SOMERS, NEW YORK**

Contract No. 16-529

Bid Opening: January 20, 2021

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

PROPOSAL REQUIREMENTS

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

PROPOSAL REQUIREMENTS

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

LUMP SUM PROPOSAL

CONTRACT NO. 16-529

BASE BID ITEMS

ITEM	DESCRIPTION	BID PRICE IN FIGURES	
		DOLLARS	CENTS
A	For providing all labor, material and equipment necessary to complete all work as shown on the contract drawings and in accordance with the specifications for the Main House Renovation, Lasdon Park, Arboretum and Veterans Memorial, Somers, New York.		
B	Contract Bonds and Insurance (Must not exceed 3.00% of Item A above)		
W800	Necessary for Miscellaneous Additional Work per Article "Miscellaneous Additional Work (Item W-800)" of Information for Bidders, as directed	\$400,000	00
W851	Necessary for Testing of Materials and Field Testing Equipment per Article "Testing of Materials and Field Testing Equipment (Item W-851)" of General Requirements, as directed	\$ 50,000	00

	DOLLARS	CENTS
TOTAL OF BASE BID (ITEMS A, B, W800 AND W851)		

COMPLETE THIS FORM USING BLACK INK ONLY

PROPOSAL PAGE 6

LUMP SUM PROPOSAL - ALTERNATES

CONTRACT NO. 16-529

ALTERNATE LUMP SUM ITEMS

ITEM	DESCRIPTION	BID PRICE IN FIGURES	
		DOLLARS	CENTS
1	For providing all labor, material and equipment necessary to complete all work as shown on the contract drawings and in accordance with the specifications for provision and installation of one diesel fueled emergency generator		
2	For providing all labor, material and equipment necessary to complete all work as shown on the contract drawings and in accordance with the specifications for rehabilitation of the North Driveway		
3	For providing all labor, material and equipment necessary to complete all work as shown on the contract drawings and in accordance with the specifications for the replacement of the exterior ramp, railings, stairs, door and storage room at the north end of the building		

COMPLETE THIS FORM USING BLACK INK ONLY

PROPOSAL PAGE 6A

CONTRACT NO. 16-529

GROSS SUM OF TOTAL BID AMOUNT

TOTAL BID FOR "BASE BID + ALTERNATES 1+2+3" (Written in Figures)	DOLLARS	CENTS

TOTAL BID FOR "BASE BID + ALTERNATES 1+2" (Written in Figures)	DOLLARS	CENTS

TOTAL BID FOR "BASE BID + ALTERNATE 1" (Written in Figures)	DOLLARS	CENTS

TOTAL BID FOR "BASE BID (Written in Figures)	DOLLARS	CENTS

COMPLETE THIS FORM USING BLACK INK ONLY

CONTRACTOR: _____

ADDRESS: _____

BY: _____

Signature/Title

PROPOSAL PAGE 6B

BASIS OF AWARD

This contract consists of the Base Bid and Three (3) Add Alternates, Alternate 1 through 3 as defined in the Specifications and on the Drawings.

It is the goal of the County to award the Base Bid and Alternates 1 through 3 if the low bid for all items are within the amount budgeted for this project. If the Base Bid and Alternates 1 through 3 exceed the amount budgeted for this project, the contract will be awarded to the bidder submitting the lowest Base Bid plus additional Alternate Bid Items in the order they are listed, to include as many Alternate Bid Items as possible, up to an amount that does not exceed the project budget. If the Base Bid and Alternate 1 exceed the amount budgeted for this project, the contract will be awarded to the bidder submitting the lowest Base Bid.

PROPOSAL PAGE 6C

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)
COUNTY OF _____) SS.:

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)

(Signature) Principal

(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:

Signature

Date: _____

Notary Public

Date: _____

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

CONTRACTOR'S DISCLOSURE STATEMENT

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

CONTRACTOR'S DISCLOSURE STATEMENT

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

CONTRACTOR'S DISCLOSURE STATEMENT

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

CONTRACTOR'S DISCLOSURE STATEMENT

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

CONTRACTOR'S DISCLOSURE STATEMENT

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

CONTRACTOR'S DISCLOSURE STATEMENT

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 Officer². 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 _____
(print name & title)

By _____
(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

INFORMATION FOR BIDDERS



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

INFORMATION FOR BIDDERS

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.

INFORMATION FOR BIDDERS

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

INFORMATION FOR BIDDERS

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

INFORMATION FOR BIDDERS

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.

INFORMATION FOR BIDDERS

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.

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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

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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

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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

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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

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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.

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- 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.

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- 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,

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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.

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- 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.

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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

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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

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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 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

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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

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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).

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- 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.

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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

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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.

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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).

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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

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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

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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

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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.

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- 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

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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;

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- 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

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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

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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

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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

INFORMATION FOR BIDDERS

(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 Officer¹ 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.

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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 Pages 11-13 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

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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

GENERAL CLAUSES

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

GENERAL CLAUSES

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

GENERAL CLAUSES

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 .

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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.

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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

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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

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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.

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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

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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

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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.

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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

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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

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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

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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

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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.

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- 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.

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- 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

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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

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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

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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

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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 Contractor 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.

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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 attach 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

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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.

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- 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 subcontractors, 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 Administrator's 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.

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- 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 shall 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

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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

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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.

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- 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

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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.

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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.

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- 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 American 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 to the 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:

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- 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

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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.

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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

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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

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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.

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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

GENERAL CLAUSES

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.

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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:

<u>Priority Order</u>	<u>Document</u>
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.

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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

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technology² 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%.

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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

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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 of lawn 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 of 2008, 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

GENERAL CLAUSES

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 of regulations, policies, procedures and local legislative decisions in connection with any action on this list.” As such, no further environmental review is required.

GENERAL CLAUSES

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:

GENERAL CLAUSES

(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

SAMPLE FORMS

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.

SAMPLE FORMS

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.

SAMPLE FORMS

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

SAMPLE FORMS

MONTHLY EMPLOYMENT UTILIZATION REPORT
County of Westchester, Department of Public Works

<u>MONTHLY EMPLOYMENT UTILIZATION REPORT</u>										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	TOTAL ALL EMPLOYEES BY TRADE				BLACK (NOT HISPANIC ORIGINAL)		WORK HOURS OF EMPLOYMENT				MINORITY PERCENTAGE %	FEMALE PERCENTAGE %	TOTAL NUMBER OF EMPLOYEES		TOTAL NUMBER OF MINORITY EMPLOYEES	
		M	HRS	F	HRS	M	F	M	F	HISPANIC	ASIAN OR PACIFIC ISLANDERS			AMERICAN INDIAN OR ALASKAN NATIVE	M	F	M
	JOURNEY WORKER																
	APPRENTICE																
	TRAINEE																
	SUB-TOTAL																
	JOURNEY WORKER																
	APPRENTICE																
	TRAINEE																
	SUB-TOTAL																
	JOURNEY WORKER																
	APPRENTICE																
	TRAINEE																
	SUB-TOTAL																
	JOURNEY WORKER																
	APPRENTICE																
	TRAINEE																
	SUB-TOTAL																
	JOURNEY WORKER																
	APPRENTICE																
	TRAINEE																
	SUB-TOTAL																
	TOTAL JOURNEY WORKER																
TOTAL APPRENTICES																	
TOTAL TRAINEES																	
GRAND TOTAL (#HRS & #EMPL)																	
COMPANY OFFICIAL'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

Forms Page 5

SAMPLE FORMS

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

[illegible]

Forms Page 7

County of Westchester, Department of Public Works

Attach a separate sheet here if more space is required.

SAMPLE FORMS

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.*

SAMPLE FORMS

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.

- ☐ New
☐ Change
☐ No Change

**Electronic Funds Transfer (EFT)
Vendor Direct Payment Authorization Form**

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:

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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:

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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**

(WC DPW E Version 11/3/08)

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Forms Page 11

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.



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

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.

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

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.

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

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

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.

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

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

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*

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

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

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

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

Notary Public

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.

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

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 or 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

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 Oblige, 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:

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.

BOND

BOND

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



SCHEDULE OF HOURLY RATES
AND SUPPLEMENTS

DEPARTMENT OF PUBLIC WORKS

Division of Engineering



Andrew M. Cuomo, Governor

Roberta Reardon, Commissioner

Westchester County DPW & T

Yolanda Spraggins, Secretary II
148 Martine Avenue, Rm 518
White Plains NY 10601

Schedule Year 2020 through 2021
Date Requested 10/09/2020
PRC# 2020010490

Location Lasdon Park
Project ID# 16-529
Project Type Main House Renovation, Lasdon Park, Arboretum and Veterans Memorial, Somers, NY

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 2020 through June 2021. 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 12240

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.

There are very few exceptions to this rule. Complete information regarding these exceptions is available on the ["Request for a dispensation to work overtime" form \(PW30\)](#) and ["4 Day / 10 Hour Work Schedule" form \(PW 30.1\)](#).

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 12240; 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, contemporaneous, 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 journeymen 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 journeyman'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 12240 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.



Andrew M. Cuomo, Governor

Roberta Reardon, Commissioner

Westchester County DPW & T

Yolanda Spraggins, Secretary II
148 Martine Avenue, Rm 518
White Plains NY 10601

Schedule Year 2020 through 2021
Date Requested 10/09/2020
PRC# 2020010490

Location Lasdon Park
Project ID# 16-529
Project Type Main House Renovation, Lasdon Park, Arboretum and Veterans Memorial, Somers, NY

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: \$ _____	Contract Type:	
Approximate Starting Date: ____/____/____	<input type="checkbox"/> (01) General Construction	
Approximate Completion Date: ____/____/____	<input type="checkbox"/> (02) Heating/Ventilation	
	<input type="checkbox"/> (03) Electrical	
	<input type="checkbox"/> (04) Plumbing	
	<input type="checkbox"/> (05) Other : _____	

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

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, www.labor.ny.gov. <https://labor.ny.gov/formsdocs/ui/IA999.pdf>

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)

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 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.

**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

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 12240

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.



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)

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.

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:**
www.labor.ny.gov

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) 568-5156		

* 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 or 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 requirements 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 than 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 12240

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	10/01/2020
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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: 07/01/2020 01/01/2021

Boilermaker	\$ 61.24	\$63.38
Repairs & Renovations	61.24	63.38

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2020 01/01/2021

Boilermaker	32% of hourly	32% of hourly
Repair \$ Renovations	Wage Paid	Wage Paid
	+ \$ 25.35	+ TBA

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 (D, O) on OVERTIME PAGE

Repairs & Renovation see (B,E,Q)

HOLIDAY

Paid: See (8, 16, 23, 24) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 12, 15, 16, 22, 23, 24, 25) on HOLIDAY PAGE

NOTE: *Employee must work in pay week to receive Holiday Pay.

**Employee gets 4 times the hourly wage rate for working Labor Day.

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:

	07/01/2020	01/01/2021
Apprentice(s)	32% of Hourly	32% of Hourly
	Wage Paid Plus	Wage Paid Plus
	Amount Below	Amount Below

1st Term	\$ 19.38	\$ TBA
2nd Term	20.24	TBA
3rd Term	21.08	TBA
4th Term	21.94	TBA
5th Term	22.79	TBA
6th Term	23.65	TBA
7th Term	24.48	TBA

NOTE: "Hourly Wage Paid" shall include any and all premium(s)

4-5

Carpenter	10/01/2020
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JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour: 07/01/2020

Piledriver	\$ 55.93
Dockbuilder	\$ 55.93

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 52.44

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
\$22.37	\$27.97	\$36.35	\$44.74

Supplemental benefits per hour:

All Terms: \$ 34.34

8-1556 Db

Carpenter

10/01/2020

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour: 07/01/2020

Carpet/Resilient

Floor Coverer \$ 54.00

INCLUDES HANDLING & INSTALLATION OF ARTIFICIAL TURF AND SIMILAR TURF INDOORS/OUTDOORS.

SUPPLEMENTAL BENEFITS

Per hour:

\$ 46.99

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
\$24.20	\$27.20	\$31.45	\$39.33

Supplemental benefits per hour:

1st	2nd	3rd	4th
\$16.06	\$17.56	\$21.16	\$23.16

8-2287

Carpenter

10/01/2020

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per Hour: 07/01/2020

Marine Construction:

Marine Diver	\$ 70.80
Marine Tender	50.34

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker \$ 52.34

OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (18, 19) on HOLIDAY PAGE

Overtime: See (5, 6, 10, 11, 13, 16, 18, 19) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

One (1) year terms.

1st year	\$ 22.37
2nd year	27.97
3rd year	36.35
4th year	44.74

Supplemental Benefits

Per Hour:

All terms \$ 34.34

8-1456MC

Carpenter

10/01/2020

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour: 07/01/2020

Building	
Millwright	\$ 55.70

SUPPLEMENTAL BENEFITS

Per hour:

Millwright \$ 54.16

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

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.
\$29.99	\$35.44	\$40.89	\$51.79

Supplemental benefits per hour:

One (1) year terms:

1st.	2nd.	3rd.	4th.
------	------	------	------

\$34.79 \$38.49 \$42.84 \$49.60

8-740.1

Carpenter

10/01/2020

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:

07/01/2020

Timberman

\$ 51.05

SUPPLEMENTAL BENEFITS

Per Hour:

07/01/2020

\$ 51.79

OVERTIME PAY

See (B, E, E2, Q) 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:

One (1) year terms:

1st	2nd	3rd	4th
\$20.42	\$25.53	\$33.18	\$40.84

Supplemental benefits per hour:

All terms \$ 34.07

8-1556 Tm

Carpenter

10/01/2020

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: 07/01/2020 10/18/2020

Core Drilling:

Driller \$ 41.19 Additional \$ 2.00

Driller Helper 32.62

Note: Hazardous Waste Pay Differential:

For Level C, an additional 10% above wage rate per hour

For Level B, an additional 10% above wage rate per hour

For Level A, an additional 10% above wage rate per hour

Note: When required to work on water: an additional \$ 0.50 per hour.

SUPPLEMENTAL BENEFITS

Per hour: 07/01/2020

Driller and Helper \$ 27.95

OVERTIME PAY

OVERTIME: See (B,E,K*,P,R**) on OVERTIME PAGE.

HOLIDAY

Paid: See (5,6) on HOLIDAY PAGE.

Overtime: * See (5,6) on HOLIDAY PAGE.

** See (8,10,11,13) on HOLIDAY PAGE.

8-1536-CoreDriller

Carpenter - Building / Heavy&Highway

10/01/2020

JOB DESCRIPTION Carpenter - Building / Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Putnam, Rockland, Westchester

WAGES

WAGES:(per hour)

	07/01/2020	07/01/2021
BUILDING/HEAVY & HIGHWAY/TUNNEL:		Additional
Carpenter	\$ 45.30	\$ 0.40

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.

NOTE: Carpenters employed in the removal or abatement of asbestos or any toxic or hazardous material or required to work near asbestos or any toxic or hazardous material and required to wear protective equipment shall receive two (2) hours extra pay per day, plus applicable supplemental benefits.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 31.53

OVERTIME PAY

BUILDING:

See (B, E, Q) on OVERTIME PAGE.

HEAVY&HIGHWAY/TUNNEL:

See (B, E, P, *R, **T, X) on OVERTIME PAGE.

*R applies to Heavy&Highway/Tunnel Overtime Holiday Code 25 with benefits at straight time rate.

**T applies to Heavy&Highway/Tunnel Overtime Holiday Codes 5 & 6 with benefits at straight time rate.

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 including benefits.

Overtime: See (5, 6, 25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

1 year terms at the following wage rates:

Indentured after July 1 2016

1st	2nd	3rd	4th	5th
\$ 22.40	\$ 26.16	\$ 28.05	\$ 29.93	\$ 33.70

Indentured before July 1 2016

1st	2nd	3rd	4th
\$ 22.40	\$ 26.16	\$ 29.93	\$ 33.70

SUPPLEMENTAL BENEFITS per hour:

All terms \$ 16.28

11-279.1B/HH

Electrician

10/01/2020

JOB DESCRIPTION Electrician

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, New York, Queens, Richmond, Westchester

WAGES

Per hour:	07/01/2020	03/10/2021
Service Technician	\$ 33.90	\$34.40

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:	\$ 18.43	\$ 19.32

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

10/01/2020

JOB DESCRIPTION Electrician

DISTRICT 8

ENTIRE COUNTIES

Westchester

WAGES

Per hour:	07/01/2020
Electrician/A-Technician	\$ 52.75
Teledata	\$ 52.75

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:	07/01/2020
Journeyworker	\$ 51.80

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:

	07/01/2020
1st term	\$ 13.00
2nd term	15.00
3rd term	17.00
4th term	19.00
MIJ 1-12 months	23.00
MIJ 13-18 months	26.50

Supplemental Benefits per hour:

	07/01/2020
1st term	\$ 9.49
2nd term	12.39
3rd term	13.72
4th term	15.05

MIJ 1-12 months	12.08
MIJ 13-18 months	13.38

8-3/W

Electrician	10/01/2020
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JOB DESCRIPTION Electrician

DISTRICT 8

ENTIRE COUNTIES

Westchester

WAGES

07/01/2020

Electrician	\$ 26.50
H - Telephone	\$ 26.50

Electrical and Teledata work of limited scope, consisting of repairs and /or replacement of defective electrical and teledata equipment.
- Includes 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.
See Electrician/A Technician classification for all new installations of wiring, conduit, junction boxes and light fixtures.

SUPPLEMENTAL BENEFITS

07/01/2020

Electrician &	
H - Telephone	\$ 13.38

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	10/01/2020
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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:

07/01/2019 03/17/2021

Elevator Constructor	\$ 69.56	\$ 72.29
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Modernization & Service/Repair	\$ 54.56	\$ 56.77
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SUPPLEMENTAL BENEFITS

Per Hour:

Elevator Constructor	\$ 41.92	\$ 42.92
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Modernization & Service/Repairs	\$ 40.86	\$ 41.82
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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:

*Note: 1st Term is based on Average wage of Constructor & Modernization.
Terms 2 thru 4 Based on Journeymans wage of classification Working in.

1 YEAR TERMS:

1st Term*	2nd Term	3rd Term	4th Term
50%	55%	65%	75%

SUPPLEMENTAL BENEFITS

Elevator Constructor

1st Term	\$ 33.38	\$ 34.05
2nd Term	34.20	34.91
3rd Term	35.55	36.30
4th Term	36.89	37.70

**Modernization &
Service/Repair**

1st Term	\$ 33.33	\$ 34.00
2nd Term	33.82	34.50
3rd Term	35.09	35.83
4th Term	36.36	37.15

4-1

Elevator Constructor

10/01/2020

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	07/01/2020	01/01/2021
Mechanic	\$ 60.49	\$62.51
Helper	70% of Mechanic Wage Rate	70% of Mechanic Wage Rate

Four (4), ten (10) hour days may be worked for New Construction and Modernization Work at straight time during a week, Monday thru Thursday or Tuesday thru Friday.

***Four (4), ten (10) hour days are not permitted for Contract Work/Repair Work

NOTE - In order to use the '4 Day/10 Hour Work Schedule' as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule', form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour	07/01/2020	01/01/2021
Journeyman/Helper	\$ 34.765*	\$ 34.825*

(*)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
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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

10/01/2020

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:	7/01/2020	5/31/2021
		Additional
Glazier	\$ 57.55	\$ 2.00
*Scaffolding	58.55	
Glass Tinting & Window Film	29.17	
**Repair & Maintenance	29.17	

*Scaffolding includes swing scaffold, mechanical equipment, scissor jacks, man lifts, booms & buckets 24' or more, but not pipe scaffolding.

**Repair & Maintenance- All repair & maintenance work on a particular building, whenever performed, where the total cumulative contract value is under \$148,837. All Glass tinting, window film, regardless of material or intended use, and all affixing of decals to windows or glass.

SUPPLEMENTAL BENEFITS

Per hour:	7/01/2020
Journeyworker	\$ 34.59
Glass tinting & Window Film	20.29
Repair & Maintenance	20.29

OVERTIME PAY

See (B,H,V) on OVERTIME PAGE.

For 'Repair & Maintenance' and 'Glass Tinting & Window Film' see (B, B2, I, S) on overtime page.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (4, 6, 16, 25) on HOLIDAY PAGE
For 'Repair & Maintenance' and 'Glass Tinting & Window Film' Only
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:

	7/01/2020
1st term	\$ 20.14
2nd term	28.21
3rd term	34.10
4th term	45.80

Supplemental Benefits:

(Per hour)	
1st term	\$ 16.16
2nd term	22.76
3rd term	25.16
4th term	29.73

8-1087 (DC9 NYC)

Insulator - Heat & Frost

10/01/2020

JOB DESCRIPTION Insulator - Heat & Frost

DISTRICT 8

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Westchester

WAGES

Per hour:	07/01/2020	05/31/2021
Insulator	\$ 55.00	\$ 2.00
Discomfort & Additional Training**	57.96	
Fire Stop Work*	29.44	

* 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	\$ 34.35
Discomfort & Additional Training	36.30
Fire Stop Work: Journeyworker	17.52

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
\$ 29.44	\$ 34.55	\$ 39.66	\$ 44.78

Discomfort & Additional Training Apprentices:			
1st	2nd	3rd	4th
\$ 30.99	\$ 36.41	\$ 41.83	\$ 47.26

Supplemental Benefits paid per hour:

Insulator Apprentices:	
1st term	\$ 17.52
2nd term	20.89
3rd term	24.25
4th term	27.61

Discomfort & Additional Training Apprentices:	
1st term	\$ 18.50
2nd term	22.06
3rd term	25.62
4th term	29.18

8-91

Ironworker

10/01/2020

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2020	01/01/2021 Additional
Ironworker Rigger	\$ 67.13	\$ 1.36

Ironworker Stone Derrickman	\$ 67.13
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SUPPLEMENTAL BENEFITS

Per hour:	\$ 40.94
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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:

1/2 year terms at the following hourly wage rate:

	1st	2nd	3rd	4th
07/01/2020	\$33.12	\$47.19	\$52.50	\$57.82

Supplemental benefits:

Per hour:	\$20.93	\$31.23	\$31.23	\$31.23
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9-197D/R

Ironworker

10/01/2020

JOB DESCRIPTION Ironworker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2020	01/01/2021 Additional
Ornamental	\$ 45.65	\$ 1.25
Chain Link Fence	45.65	
Guide Rail	45.65	

SUPPLEMENTAL BENEFITS

Per hour:	
Journeyworker:	\$ 58.05

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

Apprentices hired before 8/31/2018:

(1/2) year terms at the following percentage of Journeyman's wage.

5th Term	80%
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Supplemental Benefits per hour:	
5th Term	52.38

Apprentices Hired after 9/1/18:

1 year terms	
1st Term	\$ 21.13
2nd Term	24.77
3rd Term	36.32
4th Term	TBD

Supplemental Benefits per hour:

1st Term	\$ 17.61
2nd Term	18.86
3rd Term	52.58
4th Term	TBD

4-580-Or

Ironworker

10/01/2020

JOB DESCRIPTION Ironworker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

PER HOUR:

07/01/2020

01/01/2021

Ironworker:

Structural \$ 52.70
Bridges
Machinery

Additional

\$1.75/Hr.

SUPPLEMENTAL BENEFITS

PER HOUR:

Journeyman \$ 81.35

OVERTIME PAY

See (B, B1, Q) on OVERTIME PAGE

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	\$27.45
2nd	\$28.05
3rd - 6th	\$28.66

Supplemental Benefits

PER HOUR:

All Terms \$56.15

4-40/361-Str

Ironworker

10/01/2020

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: 07/01/2020

Reinforcing &
Metal Lathing

\$ 56.25

"Base" Wage

\$ 54.70
plus \$ 1.55

"Base" Wage is used to calculate overtime hours only.

SUPPLEMENTAL BENEFITS

Per hour:

Reinforcing & \$ 38.30

Metal Lathing

OVERTIME PAY

See (B, E, Q, *X) on OVERTIME PAGE

*Only \$22.00 per Hour for non worked hours

Supplemental Benefit Premiums for Overtime Hours worked:

Time & One Half	\$ 45.08
Double Time	\$ 51.33

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:

Wages Per Hour:

1st term	2nd term	3rd term	4th Term
\$ 22.55	\$ 28.38	\$ 34.68	\$ 37.18

SUPPLEMENTAL BENEFITS

Per Hour:

1st term	2nd term	3rd term	4th Term
\$ 18.17	\$ 21.34	\$ 22.00	\$ 20.50

4-46Reinf

Laborer - Building

10/01/2020

JOB DESCRIPTION Laborer - Building

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

WAGES

07/01/2020

Laborer	\$ 35.30 plus \$4.60**
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Laborer - Asbestos & Hazardous Materials Removal	\$ 41.55*
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* 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: 07/01/2020

Journeyworker	\$ 26.40
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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	Level E
0-1000	1001-2000	2001-3000	3001-4000	4001+
\$ 23.90	\$ 27.50	\$ 31.50	\$ 38.00	\$ 39.80

Supplemental Benefits per hour:

Apprentices	
Level A	\$ 12.35
Level B	15.20
Level C	17.80
Level D	18.20
Level E	26.40

8-235/B

Laborer - Heavy&Highway

10/01/2020

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 and Quarry Master

GROUP II: Burner, Drillers(jumbo, joy, wagon, air track, hydraulic), Drill Operator, Self Contained Rotary Drill, Curbs/ Asphalt Screedman/Raker, Bar Person.

GROUP III: Pavement Breakers, Jeep 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.

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

Wages:(per hour) 07/01/2020

GROUP I	\$44.45*
GROUP II	43.10*
GROUP III	42.70*
GROUP IV	42.35*
GROUP V	42.00*
GROUP VIA	44.00*
Operator Qualified	
Gas Mechanic	54.45*
Flagperson	35.65*

*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	\$24.35
Over 40 Hours	
Per Hour	18.10

OVERTIME PAY

See (B, E, P, R, S) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

NOTE: For Holiday Overtime: 5, 6 - Code 'S' applies
For Holiday Overtime: 8, 9, 15, 25 - Code 'R' applies

REGISTERED APPRENTICES

	1st term 1-1000hrs	2nd term 1001-2000hrs	3rd term 2001-3000hrs	4th term 3001-4000hrs
07/01/2020	\$ 23.90	\$ 28.20	\$ 32.50	\$ 36.70

Supplemental Benefits per hour:

1st term	\$ 3.85 - After 40 hours: \$ 3.60
2nd term	\$ 3.95 - After 40 hours: \$ 3.60
3rd term	\$ 4.45 - After 40 hours: \$ 4.00
4th term	\$ 5.00 - After 40 hours: \$ 4.50

8-60H/H

Laborer - Tunnel

10/01/2020

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)

	07/01/2020	07/01/2021	07/01/2022
Class 1	\$ 50.45	\$ 51.95	\$ 53.45
Class 2	52.60	54.10	55.60
Class 4	59.00	60.50	62.00
Class 5	42.25	43.50	44.80

Toxic and hazardous waste, lead abatement and asbestos abatement work will be paid an additional \$ 3.00 an hour.

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	\$ 32.15	\$ 33.25	\$ 34.45
Benefit 2	48.15	49.80	51.60
Benefit 3	64.15	66.35	68.75

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**10/01/2020**

JOB DESCRIPTION Lineman Electrician**DISTRICT** 6**ENTIRE COUNTIES**

Westchester

WAGES

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. (Ref #14.04.01)

Includes Teledata Work performed within ten (10) feet of high voltage (600 volts or over) transmission lines.

Per hour: 07/01/2020

Lineman, Tech, Welder	\$ 56.51
Crane, Crawler Backhoe	56.51
Cable Splicer-Pipe Type	62.16
Digging Mach Operator	50.86
Cert. Welder-Pipe Type	59.34
Tractor Trailer Driver	48.03
Groundman, Truck Driver	45.21
Equipment Mechanic	45.21
Flagman	33.91

Additional \$1.00 per hour for entire crew when a helicopter is used.

NOTE: 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%

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day. Tuesday thru Friday may be worked with no make-up day.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour worked (but also required on non-worked holidays):

Journeyman	\$ 24.90
	*plus 6.75% of hourly wage

*The 6.75% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q,) on OVERTIME PAGE. *Note* Double time for emergency work designated by the Dept of Jurisdiction.

NOTE: 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.

07/01/2020

1st term	\$ 33.91
2nd term	36.73
3rd term	39.56
4th term	42.38
5th term	45.21
6th term	48.03
7th term	50.86

SUPPLEMENTAL BENEFITS per hour: Same as Journeyman

6-1249aWest

Lineman Electrician - Teledata

10/01/2020

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).

	07/01/2020	01/01/2021
Cable Splicer	\$ 33.77	\$ 34.78
Installer, Repairman	\$ 32.05	\$ 33.01
Teledata Lineman	\$ 32.05	\$ 33.01
Tech., Equip. Operator	\$ 32.05	\$ 33.01
Groundman	\$ 16.99	\$ 17.50

NOTE: EXCLUDES Teledata work within ten (10) feet of High Voltage (600 volts and over) transmission lines. For this work please see LINEMAN.

NOTE: THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED:

1ST SHIFT	REGULAR RATE
2ND SHIFT	REGULAR RATE PLUS 10%
3RD SHIFT	REGULAR RATE PLUS 15%

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 5.06	\$ 5.06
	*plus 3% of wage paid	*plus 3% of 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

NOTE: 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

10/01/2020

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.

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.
(Ref #14.01.03)

Per hour: 07/01/2020

Lineman, Technician	\$ 51.61
Crane, Crawler Backhoe	51.61
Certified Welder	54.19
Digging Machine	46.45
Tractor Trailer Driver	43.87
Groundman, Truck Driver	41.29
Equipment Mechanic	41.29
Flagman	30.97

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.

NOTE: 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%

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day. Tuesday thru Friday may be worked with no make-up day.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour worked (but also required on non-worked holidays):

Journeyman	\$ 24.90
	*plus 6.75% of hourly wage

*The 6.75% is based on the hourly wage paid, straight time rate or premium rate.
Supplements paid at STRAIGHT TIME rate for holidays.

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE. *Note* Double time for emergency work designated by the Dept. of Jurisdiction.

NOTE: 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.

1st term	\$ 30.97
2nd term	33.55
3rd term	36.13
4th term	38.71
5th term	41.29
6th term	43.87
7th term	46.45

SUPPLEMENTAL BENEFITS per hour: Same as Journeyman

6-1249aWestLT

Mason - Building	10/01/2020
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JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Nassau, Rockland, Suffolk, Westchester

WAGES

Per hour:	07/01/2020	12/07/2020
		Additional
Tile Setters	\$ 60.09	\$0.88

SUPPLEMENTAL BENEFITS

Per Hour:	\$ 24.81*
	+ \$9.72

* 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:

Tile Setters:

(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
07/01/2020	\$20.35	\$25.11	\$32.09	\$36.83	\$40.25	\$43.50	\$46.95	\$51.69	\$54.34	\$58.19

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$12.55*	\$12.55*	\$15.06*	\$15.06*	\$16.06*	\$17.56*	\$18.56*	\$18.56*	\$16.56*	\$21.81*
+\$0.66	+\$0.70	+\$0.80	+\$0.85	+\$1.23	+\$1.27	+\$1.62	+\$1.67	+\$5.82	+\$6.31

* This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/52A

Mason - Building	10/01/2020
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JOB DESCRIPTION Mason - Building

DISTRICT 11

ENTIRE COUNTIES

Putnam, Rockland, Westchester

PARTIAL COUNTIES

Orange: Only the Township of Tuxedo.

WAGES

Per hour:

07/01/2020

Bricklayer	\$ 42.09
Cement Mason	42.09
Plasterer/Stone Mason	42.09
Pointer/Caulker	42.09

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 work day is mandated or required by state, federal, county, local or other governmental agency contracts, the following premiums apply:

Irregular work day 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	\$ 35.00
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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) 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

10/01/2020

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Building:

	07/01/2020	01/01/2021
Wages per hour:		Additional \$0.95

Mosaic & Terrazzo Mechanic \$57.42

Mosaic & Terrazzo Finisher \$55.82

SUPPLEMENTAL BENEFITS

Per hour:

Mosaic & Terrazzo Mechanic \$ 25.61*
+ \$11.47

Mosaic & Terrazzo Finisher \$ 25.61*

+ \$11.45

*This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY

See (A, E, Q) on OVERTIME PAGE

Deduct \$6.60 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:

(750 Hour) terms at the following wage rate.

	1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2020	\$25.40	\$27.94	\$30.49	\$33.03	\$35.57	\$38.11	\$43.20	\$48.28

Supplemental benefits per hour:

07/01/2020	\$ 12.81*	\$ 14.09*	\$ 15.37*	\$ 16.65*	\$ 17.93*	\$ 19.21*	\$ 21.77*	\$ 24.33*
	+\$9.04	+\$9.94	+\$10.84	+\$11.75	+\$12.65	+\$13.55	+\$15.36	+\$17.16

Apprentices hired after 07/01/2017:

Wages Per hour:

	1st 0- 1500	2nd 1501- 3000	3rd 3001- 3750	4th 3751- 4500	5th 4501- 5250	6th 5251- 6000
07/01/2020	\$22.20	\$22.88	\$30.49	\$35.57	\$40.65	\$45.73

Supplemental Benefits per hour:

	1st	2nd	3rd	4th	5th	6th
07/01/2020	\$4.55*	\$11.52*	\$15.37*	\$17.93*	\$20.49*	\$23.05*
	+\$6.32	+\$8.13	+\$10.84	+\$12.65	+\$14.46	+\$16.22

*This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/3

Mason - Building

10/01/2020

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour: 07/01/2020 01/01/2021

Building-Marble Restoration: Additional
\$1.10

Marble, Stone &
Terrazzo Polisher, etc \$ 44.66

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker:

Building-Marble Restoration:

Marble, Stone &
Polisher \$ 28.41

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
1ST TERM APPRENTICE GETS PAID FOR ALL OBSERVED HOLIDAYS.

REGISTERED APPRENTICES

WAGES per hour:

900 hour term at the following wage:

	1st 1- 900	2nd 901- 1800	3rd 1801- 2700	4th 2701
07/01/2020	\$31.19	\$35.68	\$40.16	\$44.66

Supplemental Benefits Per Hour:

07/01/2020	\$ 25.78	\$ 26.66	\$ 27.54	\$ 28.41	9-7/24-MP
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Mason - Building 10/01/2020

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Wages:	07/01/2020	01/14/2021
		Additional
Marble Cutters & Setters	\$ 60.35	\$0.95

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker	\$ 37.24
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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:

750 hour terms at the following wage.

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- 6751	6751- 7500
07/01/2020									
\$24.15	\$27.15	\$30.16	\$33.19	\$36.20	\$39.20	\$42.15	\$45.26	\$51.28	\$57.34

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$20.14	\$21.58	\$23.02	\$24.42	\$25.85	\$27.29	\$28.72	\$30.12	\$32.98	\$35.81

9-7/4

Mason - Building 10/01/2020

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Nassau, Rockland, Suffolk, Westchester

WAGES

Per hour:	07/01/2020	12/07/2020
		Additional
Tile Finisher	\$ 46.21	\$0.73

SUPPLEMENTAL BENEFITS

Per Hour:	\$ 21.56*
	+ \$9.65

*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 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

10/01/2020

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2020	01/01/2021
Marble, Stone, etc.		Additional
Maintenance Finishers:	\$ 25.53	\$0.68

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.

SUPPLEMENTAL BENEFITS

Per Hour:	
Marble, Stone, etc	
Maintenance Finishers:	\$ 13.85

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:	07/01/2020
0-750	\$17.87
751-1500	\$18.89
1501-2250	\$19.92
2251-3000	\$20.93
3001-3750	\$22.47
3751-4500	\$24.51
4501+	\$25.53

Supplemental Benefits:

Per hour:	
0-750	\$ 13.73
751-1500	\$ 13.75
1501-2250	\$ 13.76
2251-3000	\$ 13.78

3001-3750	\$ 13.80
3751-4500	\$ 13.83
4501+	\$ 13.85

9-7/24M-MF

Mason - Building / Heavy&Highway

10/01/2020

JOB DESCRIPTION Mason - Building / Heavy&Highway

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2020	01/14/2021
		Additional
Marble-Finisher	\$ 47.92	\$0.61

SUPPLEMENTAL BENEFITS

Journeyworker:
per hour

Marble- Finisher \$ 34.99

OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY

Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

* Work beyond 8 hours on a Saturday shall be paid at double the rate.

** When an observed holiday falls on a Sunday, it will be observed the next day.

9-7/20-MF

Mason - Heavy&Highway

10/01/2020

JOB DESCRIPTION Mason - Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Putnam, Rockland, Westchester

PARTIAL COUNTIES

Orange: Only the Township of Tuxedo.

WAGES

Per hour:	07/01/2020
Bricklayer	\$ 42.60
Cement Mason	42.60
Marble/Stone Mason	42.60
Plasterer	42.60
Pointer/Caulker	42.60

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 work day is mandated or required by state, federal, county, local or other governmental contracts, the following rates apply:

Irregular work day 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 \$ 34.99

OVERTIME PAY

Cement Mason See (B, E, Q, W, X)

All Others See (B, E, Q, X)

HOLIDAY

Paid: See (5, 6, 15, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 15, 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-H/H

Operating Engineer - Building

10/01/2020

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) 07/01/2020

Building Construction:

Party Chief	\$ 74.75
Instrument Man	\$ 59.53
Rodman	\$ 40.79

Steel Erection:

Party Chief	\$ 78.44
Instrument Man	\$ 62.74
Rodman	\$ 44.39

Heavy Construction-NYC counties only:
(Foundation, Excavation.)

Party Chief	\$ 83.87
Instrument man	\$ 63.61
Rodman	\$ 54.59

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2020

Building Construction & Steel \$ 22.85* + 6.90

Heavy Construction \$ 23.10* + 6.90

* This portion subject to same premium as wages

Non-Worked Holiday Supplemental Benefit:

\$ 16.45

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

10/01/2020

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.

GROUP VI-B: Utility Man, Warehouse Man.

WAGES: (per hour)

07/01/2020

GROUP I	
Cranes- up to 49 tons	\$ 61.70
Cranes- 50 tons to 99 tons	63.86
Cranes- 100 tons and over	72.99
GROUP I-A	53.95
GROUP I-B	49.68
GROUP II	52.03
GROUP III-A	50.11
GROUP III-B	47.67
GROUP IV-A	49.60
GROUP IV-B	41.85
GROUP V	45.17
GROUP VI-A	52.96
GROUP VI-B	
Utility Man	42.83
Warehouse Man	44.92

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:

07/01/2020

Journeyworker	\$ 28.52
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OVERTIME PAY

OVERTIME:..... See (B, E,P,R*,T**,U***,V) on OVERTIME PAGE.

HOLIDAY

Paid:..... See (5, 6, 11, 12, 15, 25) on HOLIDAY PAGE.

Overtime:..... See (5, 6, 11, 12, 15, 25) on HOLIDAY PAGE.

* For Holiday codes 11, 12, 15, 25, code R applies.

** For Holiday code 28, code T applies

*** For Holiday codes 5 & 6, code U applies

8-137B

Operating Engineer - Heavy&Highway

10/01/2020

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.

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), Vibratory Roller (Riding), Welder.

GROUP II-B: Mechanic (Outside) All Types.

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).

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: 07/01/2020

Group I	\$ 62.38
Group I-A	54.95
Group I-B	57.92
Group II-A	52.61
Group II-B	54.26
Group III	51.68
Group IV-A	46.93
Group IV-B	40.24
Group V-A	
Engineer All Tower, Climbing and	
Cranes of 100 Tons	70.72
Hoist Engineer(Steel)	64.00
Engineer(Pile Driver)	68.27
Jersey Spreader,Pavement Breaker (Air	
Ram)Post Hole Digger	53.83

SHIFT DIFFERENTIAL:

A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts
on all government mandated off-shift work

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.

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday; Friday may be used as a make-up day.

NOTE - In order to use the 4 Day/10 Hour Work scheduleRegistration for Use of 4 Day/10 Hour Work Schedule,form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker:	07/01/2020
	\$ 30.50 up to 40 Hours
	After 40 hours \$ 21.35* PLUS \$ 1.15 on all hours worked

*This amount is subject to premium

OVERTIME PAY

See (B, E, E2, P, *R, **U) on OVERTIME PAGE

HOLIDAY

Paid:..... See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

Overtime..... See (5, 6, 8, 9, 15, 25) on OVERTIME PAGE

* For Holiday codes 8,9,15,25 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.

07/01/2020

1st term	\$ 27.48
2nd term	32.97
3rd term	38.47
4th term	43.96

Supplemental Benefits per hour:

\$ 22.50

8-137HH

Operating Engineer - Heavy&Highway

10/01/2020

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

Catogories cover GPS & Underground Surveying

Per Hour: 07/01/2020

Party Chief \$ 81.06

Instrument Man 61.32

Rodman 52.53

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2020

All Catogories

Straight Time: \$ 23.10* plus \$6.90

Premium:

Time & 1/2 \$ 34.65* plus \$6.90

Double Time \$ 46.20* plus \$6.90

Non-Worked Holiday Supplemental Benefits:

\$ 16.45

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

10/01/2020

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.

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), Vibratory Roller(riding), Welder.

GROUP II-B: Mechanic(outside)all types.

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).

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)

07/01/2020

GROUP I	\$ 62.38
GROUP I-A	54.95
GROUP I-B	57.92
GROUP II-A	52.61
GROUP II-B	54.26
GROUP III	51.68
GROUP IV-A	46.93
GROUP IV-B	40.24
GROUP V-A	
Engineer-Cranes	70.72
Engineer-Pile Driver	68.27
Hoist Engineer	64.00
Jersey Spreader	53.83
Pavement Breaker	53.83
Post Hole Digger	53.83

SHIFT DIFFERENTIAL:

A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts
on all government mandated off-shift work

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.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker:

07/01/2020

\$ 22.50

+ \$8.00

(Limited to
first 40 hours)

OVERTIME PAY

See (D, O, *U, V) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

* Note: 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 rates:

07/01/2020

1st term \$ 27.48

2nd term 32.97

3rd term 38.47

4th term 43.96

Supplemental Benefits per hour:

07/01/2020

All terms \$ 22.50

8-137Tun

Operating Engineer - Marine Dredging

10/01/2020

JOB DESCRIPTION Operating Engineer - Marine Dredging

DISTRICT 4

ENTIRE COUNTIES

Albany, Bronx, Cayuga, Chautauqua, Clinton, Columbia, Dutchess, Erie, Essex, Franklin, Greene, Jefferson, Kings, Monroe, Nassau, New York, Niagara, Orange, Orleans, 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: 07/01/2020 10/01/2020

CLASS A1 \$ 40.31 \$ 41.42

Deck Captain, Leverman

Mechanical Dredge Operator

Licensed Tug Operator 1000HP or more.

CLASS A2 35.92 36.91

Crane Operator (360 swing)

CLASS B To conform to Operating Engineer
Dozer, Front Loader Prevailing Wage in locality where work
Operator on Land is being performed including benefits.

CLASS B1 34.86 35.82

Derrick Operator (180 swing)

Spider/Spill Barge Operator

Operator II, Fill Placer,

Engineer, Chief Mate, Electrician,
Chief Welder, Maintenance Engineer
Licensed Boat, Crew Boat Operator

CLASS B2 Certified Welder	32.82	33.72
CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer	31.92	32.80
CLASS C2 Boat Operator	30.89	31.74
CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook, Messman, Porter/Janitor	25.66	26.37

SUPPLEMENTAL BENEFITS

Per Hour:

THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes A & B	07/01/2020 \$11.58 plus 7.5% of straight time wage, Overtime hours add \$ 0.63	10/01/2020 \$11.98 plus 8% of straight time wage, Overtime hours add \$ 0.63
All Class C	\$11.28 plus 7.5% of straight time wage, Overtime hours add \$ 0.48	11.68 plus 8% of straight time wage, Overtime hours add \$ 0.48
All Class D	\$10.98 plus 7.5% of straight time wage, Overtime hours add \$ 0.33	11.38 plus 8% of straight time wage, Overtime hours add \$ 0.33

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 10/01/2020

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 Dutchess 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: 07/01/2020
Survey Classifications

Party Chief	\$ 45.32
Instrument Man	37.85
Rodman	33.14

SUPPLEMENTAL BENEFITS

Per Hour:

All Crew Members: \$ 19.50

OVERTIME PAY

OVERTIME:.... See (B, E*, Q, V) ON OVERTIME PAGE.

*Doubletime 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

9-15dconsult

Painter

10/01/2020

JOB DESCRIPTION Painter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour: 07/01/2020

Brush \$ 49.20*

Abatement/Removal of lead based
or lead containing paint on
materials to be repainted. 49.20*

Spray & Scaffold \$ 52.20*

Fire Escape 52.20*

Decorator 52.20*

Paperhanger/Wall Coverer 51.96*

*Subtract \$ 0.10 to calculate premium rate.

SUPPLEMENTAL BENEFITS

Per hour: 07/01/2020

Paperhanger \$ 30.70

All others 28.81

Premium 32.10**

**Applies only to "All others" category, not paperhanger journeyworker.

OVERTIME PAY

See (A, H) 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: 07/01/2020

Appr 1st term... \$ 19.12*

Appr 2nd term... 24.52*

Appr 3rd term... 29.72*

Appr 4th term... 39.75*

*Subtract \$ 0.10 to calculate premium rate.

Supplemental benefits:

Per Hour: 07/01/2020

Appr 1st term... \$ 14.32

Appr 2nd term... 17.78

Appr 3rd term... 20.50

Appr 4th term... 25.89

8-NYDC9-B/S

Painter

10/01/2020

JOB DESCRIPTION Painter

DISTRICT 8

ENTIRE COUNTIES

Putnam, Suffolk, Westchester

PARTIAL COUNTIES

Nassau: All of Nassau except the areas described below: Atlantic Beach, Ceadhurst, 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:	07/01/2020
Drywall Taper	\$ 49.20*

*Subtract \$ 0.10 to calculate premium rate.

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2020
Journeyman	\$ 28.81

OVERTIME PAY

See (A, H) on OVERTIME PAGE

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages - Per Hour:	07/01/2020
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1500 hour terms at the following wage rate:

1st term	\$ 19.12*
2nd term	24.52*
3rd term	29.72*
4th term	39.75*

*Subtract \$ 0.10 to calculate premium rate.

Supplemental Benefits - Per hour:

One year term (1500 hours) at the following dollar amount.

1st year	\$ 14.32
2nd year	17.78
3rd year	20.40
4th year	25.89

8-NYDCT9-DWT

Painter - Bridge & Structural Steel

10/01/2020

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:	07/01/2020	10/01/2020	10/01/2021
	\$ 50.25	\$ 51.50	\$ 53.00
	+ 7.88*	+ 8.63*	+ 9.63*

ADDITIONAL \$6.00 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 (no 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:	07/01/2020	10/01/2020	10/01/2021
	\$ 10.20	\$ 10.90	\$ 10.90
	+ 29.65*	+ 30.00*	+ 30.60*

* 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 (no 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

	07/01/2020	10/01/2020	10/01/2021
1st year	\$ 20.10 + 3.15*	\$ 20.60 + 3.45*	\$ 21.20 + 3.86*
2nd year	\$ 30.15 + 4.73*	\$ 30.90 + 5.18*	\$ 31.80 + 5.78*
3rd year	\$ 40.20 + 6.30*	\$ 41.20 + 6.90*	\$ 42.40 + 7.71*
Supplemental Benefits - Per hour:			
1st year	\$.25 + 11.86*	\$.25 + 12.00*	\$.25 + 12.24*
2nd year	\$ 10.20 + 17.79*	\$ 10.90 + 18.00*	\$ 10.90 + 18.36*
3rd year	\$ 10.20 + 23.72*	\$ 10.90 + 24.00*	\$ 10.90 + 24.48*

NOTE: All premium wages are to be calculated on base rate per hour only.

8-DC-9/806/155-BrSS

Painter - Line Striping

10/01/2020

JOB DESCRIPTION Painter - Line Striping

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:

Painter (Striping-Highway):	07/01/2020	07/01/2021	07/01/2022
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Striping-Machine Operator*	\$ 30.10	\$ 30.32	\$ 31.53
Linerman Thermoplastic	\$ 36.53	\$ 36.93	\$ 38.34

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.

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day.

NOTE - In order to use the '4 Day/10 Hour Work Schedule,' as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour paid:	07/01/2020	07/01/2021	07/01/2022
Journeyworker:			
Striping Machine Operator:	\$ 9.16	\$ 10.03	\$ 10.03
Linerman Thermoplastic:	\$ 9.16	\$ 10.03	\$ 10.03

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:

	07/01/2020	07/01/2021	07/01/2022
1st Term:	\$ 12.04	\$ 12.12	\$ 12.61
2nd Term:	\$ 18.06	\$ 18.19	\$ 19.82
3rd Term:	\$ 24.08	\$ 24.26	\$ 25.22

Supplemental Benefits per hour:

1st term:	\$ 9.16	\$ 10.03	\$ 10.03
2nd Term:	\$ 9.16	\$ 10.03	\$ 10.03
3rd Term:	\$ 9.16	\$ 10.03	\$ 10.03

8-1456-LS

Painter - Metal Polisher

10/01/2020

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

	07/01/2020
Metal Polisher	\$ 36.33
Metal Polisher*	37.43
Metal Polisher**	40.33

*Note: Applies on New Construction & complete renovation

** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2020

Journeyworker:	
All classification	\$ 9.94

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, 9, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

One (1) year term at the following wage rates:

	07/01/2020
1st year	\$ 16.00
2nd year	17.00
3rd year	18.00
1st year*	\$ 16.39
2nd year*	17.44
3rd year*	18.54
1st year**	\$ 18.50
2nd year**	19.50
3rd year**	20.50

*Note: Applies on New Construction & complete renovation

** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits:

Per hour:

1st year	\$ 6.69
2nd year	6.69
3rd year	6.69

8-8A/28A-MP

Plumber

10/01/2020

JOB DESCRIPTION Plumber

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

WAGES

Per hour:

	07/01/2020
Plumber and Steamfitter	\$ 57.86

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	\$ 37.56
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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	\$ 21.44
2nd Term	24.62

3rd Term	28.42
4th Term	40.61
5th Term	43.58

Supplemental Benefits per hour:

1st term	\$ 15.59
2nd term	17.38
3rd term	20.69
4th term	27.20
5th term	28.82

8-21.1-ST

Plumber - HVAC / Service

10/01/2020

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 Walkill and Shawangunk Prisons) except for remainder of Town of Shawangunk and Towns of Plattekill, Marlboro, and Wawarsing.

WAGES

Per hour: 07/01/2020

HVAC Service \$ 39.68
+ \$ 4.32*

*Note: This portion of wage is not subject to overtime premium.

SUPPLEMENTAL BENEFITS

Per hour:
07/01/2020

Journeyworker HVAC Service
\$ 25.14

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:

07/01/2020				
1st yr.	2nd yr.	3rd yr.	4th yr.	5th yr.
\$ 18.05	\$ 21.33	\$ 26.66	\$ 32.76	\$ 35.46
+\$2.37*	+\$2.67*	+\$3.22*	+\$3.84*	+\$4.07*

*Note: This portion of wage is not subject to overtime premium.

Supplemental Benefits per hour:

Apprentices 07/01/2020

1st term	\$ 19.03
2nd term	20.09
3rd term	21.30
4th term	22.90
5th term	24.07

8-21.1&2-SF/Re/AC

Plumber - Jobbing & Alterations

10/01/2020

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: 07/01/2020

Journeyworker: \$ 44.91

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
\$ 31.60

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	\$ 19.52
2nd year	21.65
3rd year	23.42
4th year	32.92
5th year	34.76

Supplemental Benefits per hour:

1st year	\$ 10.21
2nd year	12.05
3rd year	15.88
4th year	21.42
5th year	23.29

8-21.3-J&A

Roofer

10/01/2020

JOB DESCRIPTION Roofer

DISTRICT 9

ENTIRE COUNTIES

Bronx, Dutchess, Kings, New York, Orange, Putnam, Queens, Richmond, Rockland, Sullivan, Ulster, Westchester

WAGES

Per Hour: 07/01/2020

Roofer/Waterproofer \$ 44.25
+ \$7.00*

* This portion is not subject to overtime premiums.

Note: Abatement/Removal of Asbestos containing roofs and roofing material is classified as Roofer.

SUPPLEMENTAL BENEFITS

Per Hour: \$ 27.87

OVERTIME PAY

See (B, H) on OVERTIME PAGE

Note: An observed holiday that falls on a Sunday will be observed the following Monday.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1) year term

1st	2nd	3rd	4th
\$ 15.49	\$ 22.13	\$ 26.55	\$ 33.19
	+ 3.00*	+ 4.20*	+ 5.26*

Supplements:

1st	2nd	3rd	4th
\$ 3.57	\$ 14.10	\$ 16.85	\$ 20.98

9-8R

Sheetmetal Worker

10/01/2020

JOB DESCRIPTION Sheetmetal Worker

DISTRICT 8

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

07/01/2020

SheetMetal Worker \$ 43.65
+ 3.27*

*This portion is not subject to overtime premiums.

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 \$ 42.55

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
\$ 16.16	\$ 18.18	\$ 20.21	\$ 22.23	\$ 24.24	\$ 26.27	\$ 28.77	\$ 31.27
+ 1.31*	+ 1.47*	+ 1.64*	+ 1.80*	+ 1.96*	+ 2.13*	+ 2.29*	+ 2.45*

*This portion is not subject to overtime premiums.

Supplemental Benefits per hour:

Apprentices

1st term	\$ 18.31
2nd term	20.60
3rd term	22.88
4th term	25.19
5th term	27.47
6th term	29.75
7th term	31.56
8th term	33.39

8-38

Sheetmetal Worker

10/01/2020

JOB DESCRIPTION Sheetmetal Worker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per Hour: 07/01/2020 8/01/2020

Sign Erector \$ 50.79 \$ 52.29

NOTE: Structurally Supported Overhead Highway Signs(See STRUCTURAL IRON WORKER CLASS)

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2020	8/01/2020
Sign Erector	\$ 49.82	\$ 51.26

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:

07/01/2020

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 13.96	\$ 15.81	\$ 17.68	\$ 19.56	\$ 27.26	\$ 29.65	\$ 32.80	\$ 35.26	\$ 37.71	\$ 40.15

8/01/2020

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 14.34	\$ 16.26	\$ 18.17	\$ 20.10	\$ 28.02	\$ 30.47	\$ 33.72	\$ 36.27	\$ 38.77	\$ 41.29
									4-137-SE

Sprinkler Fitter

10/01/2020

JOB DESCRIPTION Sprinkler Fitter

DISTRICT 1

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

Per hour

07/01/2020

Sprinkler Fitter	\$ 45.52
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SUPPLEMENTAL BENEFITS

Per hour

Journey person	\$ 27.57
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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 percentage of journey person's wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 21.97	\$ 24.41	\$ 26.59	\$ 29.02	\$ 31.45	\$ 33.88	\$ 36.31	\$ 38.74	\$ 41.17	\$ 43.60

Supplemental Benefits per hour

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 8.27	\$ 8.27	\$ 18.70	\$ 18.70	\$ 18.95	\$ 18.95	\$ 18.95	\$ 18.95	\$ 18.95	\$ 18.95
									1-669.2

Teamster - Building / Heavy&Highway

10/01/2020

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)

07/01/2020

GROUP A	\$ 42.47*
GROUP AA	45.27*
GROUP B	43.09*
GROUP BB	42.59*
GROUP C	45.22*
GROUP D	42.92*
GROUP E	43.47*
GROUP F	44.47*
GROUP G	43.22*
GROUP H	43.84*
GROUP HH	44.22*
GROUP I	43.97*
GROUP II	44.34*

* To calculate premium wage, subtract \$.20 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 Differential: NYS DOT or other Governmental Agency contracts shall receive a shift differential of Fifteen(15%) percent above the wage rate

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker

First 40 hours	\$ 33.64
41st-45th hours	15.18
Over 45 hours	0.26

OVERTIME PAY

See (B, E, P, R) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

Welder**10/01/2020**

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 07/01/2020

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



New York State Department of Labor - Bureau of Public Work
State Office Building Campus
Building 12 - Room 130
Albany, New York 12240

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

☐ 10 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

☐ Guards, Watchmen

☐ Janitors, Porters, Cleaners,
Elevator Operators

☐ Moving furniture and
equipment

☐ Trash and refuse removal

☐ Window cleaners

☐ Other (Describe)

9. Has this project been reviewed for compliance with the Wicks Law involving separate bidding?

YES ☐ NO ☐

10. Name and Title of Requester

Signature



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://applications.labor.ny.gov/EDList/searchPage.do>

For inquiries where WCB is listed as the "Agency", please call 1-866-546-9322

NYSDOL Bureau of Public Work Debarment List 07/28/2020

Article 8

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	NYC	*****9839	A.J.S. PROJECT MANAGEMENT, INC.		149 FIFTH AVENUE NEW YORK NY 10010	12/29/2016	12/29/2021
DOL	DOL	*****3344	ACT INC		6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	DOL	*****4018	ADIRONDACK BUILDING RESTORATION INC.		4156 WILSON ROAD EAST TABERG NY 13471	03/26/2019	03/26/2024
DOL	AG	*****1812	ADVANCED BUILDERS & LAND DEVELOPMENT, INC.		400 OSER AVE #2300HAUPPAUGE NY 11788	09/11/2019	09/11/2024
DOL	DOL	*****1687	ADVANCED SAFETY SPRINKLER INC		261 MILL ROAD P.O BOX 296EAST AURORA NY 14052	07/29/2015	07/29/2020
DOL	DOL	*****1687	ADVANCED SAFETY SPRINKLER INC		261 MILL ROAD P.O BOX 296EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	NYC	*****6775	ADVENTURE MASONRY CORP.		1535 RICHMOND AVENUE STATEN ISLAND NY 10314	12/13/2017	12/13/2022
DOL	NYC		AGOSTINHO TOME		405 BARRETTO ST BRONX NY 10474	05/31/2018	05/31/2023
DOL	DOL		AJ TORCHIA		10153 ROBERTS RD SAUQUOIT NY 13456	08/09/2016	08/09/2021
DOL	DOL	*****3344	ALL CATASTROPHE CONSTRUCTION TEAM INC	ACT INC	6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	DOL		AMADEO J TORCHIA	TORCHIA'S HOME IMPROVEMENT	10153 ROBERTS RD SAUQUOIT NY 13456	08/09/2016	08/09/2021
DOL	NYC		AMJAD NAZIR		2366 61ST ST BROOKLYN NY 11204	12/15/2016	12/15/2021
DOL	DOL		ANGELO F COKER			12/04/2018	12/04/2023
DOL	NYC		ANISUL ISLAM		C/O RELIANCE GENERAL CONS 644 OCEAN PARKWAYBROOKLYN NY 11230	09/02/2015	09/02/2020
DOL	DOL		ANITA SALERNO		158 SOLAR ST SYRACUSE NY 13204	01/07/2019	01/07/2024
DOL	NYC		ANTHONY J SCLAFANI		149 FIFTH AVE NEW YORK NY 10010	12/29/2016	12/29/2021
DOL	DOL		ANTHONY PERGOLA		3 WEST MAIN ST/SUITE 208 ELMSFORD NY 10323	01/23/2017	01/23/2022
DOL	DOL		ANTONIO ESTIVEZ		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	*****3020	APCO CONTRACTING CORP		24 SOUTH MARYLAND AVENUE PORT WASHINGTON NY 11050	09/24/2012	09/02/2020
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	DOL		ARVINDER ATWAL		65 KENNETH PLACE NEW HYDE PARK NY 11040	07/19/2017	07/19/2022
DOL	NYC	*****4779	ASTORIA GENERAL CONTRACTING CORP		35-34 31ST STREET LONG ISLAND CITY NY 11106	09/02/2015	09/02/2020
DOL	NYC	*****7217	ASTRO COMMUNICATIONS OF NY CORP		79 ALEXANDER AVE- STE 36A BRONX NY 10454	10/30/2015	10/30/2020
DOL	NYC	*****6683	ATLAS RESTORATION CORP.		35-12 19TH AVENUE ASTORIA NY 11105	08/02/2017	08/02/2022
DOL	NYC	*****5532	ATWAL MECHANICALS, INC		65 KENNETH PLACE NEW HYDE PARK NY 11040	07/19/2017	07/19/2022
DOL	NYC	*****2591	AVI 212 INC.		260 CROSEY AVENUE APT 11GBROOKLYN NY 11214	10/30/2018	10/30/2023
DOL	AG		AVTAR SINGH		116-24 127TH STREET SOUTH OZONE PARK NY 11420	12/22/2015	12/22/2020
DOL	AG		BALDEV SINGH		116-24 127TH STREET SOUTH OZONE PARK NY 11420	12/22/2015	12/22/2020
DOL	NYC		BALWINDER SINGH		421 HUDSON ST SUITE C5NEW YORK NY 10014	02/20/2019	02/20/2024
DOL	DOL		BARRY KINNEY		6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020

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DOL	NYC	*****3915	BEACON RESTORATION INC		SUITE B-8 782 PELHAM PARKWAY SOUTHBRONX NY 10462	04/21/2016	04/21/2021
DOL	NYC	*****8416	BEAM CONSTRUCTION, INC.		50 MAIN ST WHITE PLAINS NY 10606	01/04/2019	01/04/2024
DOL	DOL		BIAGIO CANTISANI			06/12/2018	06/12/2023
DOL	DOL	*****4512	BOB BRUNO EXCAVATING, INC		5 MORNINGSIDE DR AUBURN NY 13021	05/28/2019	05/28/2024
DOL	DOL		BOGDAN MARKOVSKI		370 W. PLEASANTVIEW AVE SUITE 2.329HACKENSACK NJ 07601	02/11/2019	02/11/2024
DOL	DOL	*****8551	BRANDY'S MASONRY		216 WESTBROOK STREET P O BOX 304SAYRE PA 18840	08/09/2016	08/09/2021
DOL	DOL	*****1449	BRRESTORATION NY INC		140 ARCADIA AVENUE OSWEGO NY 13126	09/12/2016	09/12/2021
DOL	DOL		BRUCE MORSEY		C/O KENT HOLLOW SIDING LL 29A BRIDGE STREETNEW MILFORD CT 06776	01/15/2016	01/15/2021
DOL	DOL		BRUCE P. NASH JR.		5841 BUTTERNUT ROAD EAST SYRACUSE NY 13057	09/12/2018	09/12/2023
DOL	DOL	*****0225	C&D LAFACE CONSTRUCTION, INC.		8531 OSWEGO RD BALDWINVILLE NY 13027	02/03/2020	01/09/2023
DOL	DOL	*****8809	C.B.E. CONTRACTING CORPORATION		310 MCGUINESS BLVD GREENPOINT NY 11222	03/07/2017	03/07/2022
DOL	DOL	*****9383	C.C. PAVING AND EXCAVATING, INC.		2610 SOUTH SALINA ST SUITE 12SYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	NYC		CALVIN WALTERS		465 EAST THIRD ST MT. VERNON NY 10550	09/09/2019	09/09/2024
DOL	DOL		CANTISANI & ASSOCIATES LTD		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CANTISANI HOLDING LLC			06/12/2018	06/12/2023
DOL	DOL		CARIBBEAN POOLS		C/O DOUGLAS L MALARKEY 64 VICTORIA DRIVEBINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL		CARMEN RACHETTA		8531 OSWEGO RD BALDWINVILLE NY 13027	02/03/2020	02/03/2025
DOL	DOL		CARMENA RACHETTA		8531 OSWEGO ROAD BALDWINVILLE NY 13027	02/03/2020	01/09/2023
DOL	DOL	*****3812	CARMODY "2" INC			06/12/2018	06/12/2023
DOL	DOL	*****1143	CARMODY BUILDING CORP	CARMODY CONTRACTIN G AND CARMODY CONTRACTIN G CORP.	442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CARMODY CONCRETE CORPORATION			06/12/2018	06/12/2023
DOL	DOL		CARMODY ENTERPRISES, LTD.		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CARMODY INC		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	*****3812	CARMODY INDUSTRIES INC			06/12/2018	06/12/2023
DOL	DOL		CARMODY MAINTENANCE CORPORATION		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CARMODY MASONRY CORP		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	*****8809	CBE CONTRACTING CORP		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	AG		CESAR J. AGUDELO		81-06 34TH AVENUE APT. 6EJACKSON HEIGHTS NY 11372	02/07/2018	02/07/2023
DOL	DOL	*****7655	CHAMPION CONSTRUCTION SERVICES CORP		2131 SCHENECTADY AVENUE BROOKLYN NY 11234	11/18/2015	11/18/2020
DOL	DOL		CHARLES ZIMMER JR		216 WESTBROOK STREET P O BOX 304SAYRE PA 18840	08/09/2016	08/09/2021
DOL	DOL		CHRISTINE J HEARNE		C/O C.J-HEARNE CONSTRUCTIO 131 PONCE DE LEON AVE NEATLANTA GA 30308	12/01/2015	12/01/2020
DOL	DOL		CHRISTOPHER J MAINI		19 CAITLIN AVE JAMESTOWN NY 14701	09/17/2018	09/17/2023

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DOL	DOL		CHRISTOPHER PAPASTEFANOU A/K/A CHRIS PAPASTEFANOU		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL	*****0671	CJ-HEARNE CONSTRUCTION CO		SUITE 204 131 PONCE DE LEON AVENUEATLANTA GA 30308	12/01/2015	12/01/2020
DOL	DOL	*****1927	CONSTRUCTION PARTS WAREHOUSE, INC.	CPW	5841 BUTTERNUT ROAD EAST SYRACUSE NY 13057	09/12/2018	09/12/2023
DOL	NYC	*****2164	CREATIVE TRUCKING INC		58-83 54TH STREET MASPETH NY 11378	02/26/2016	02/26/2021
DOL	DOL	*****2524	CSI ELECTRICAL & MECHANICAL INC		42-32 235TH ST DOUGLSTON NY 11363	01/14/2019	01/14/2024
DOL	DOL	*****7761	D L MALARKEY CONSTRUCTION		64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL	*****7888	D L MALARKEY CONSTRUCTION INC		64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL	*****5629	DAKA PLUMBING AND HEATING LLC		2561 ROUTE 55 POUGHQUAG NY 12570	02/19/2016	02/19/2021
DOL	NYC		DALJIT KAUR BOPARAI		185-06 56TH AVE FRESH MEADOW NY 11365	10/17/2017	10/17/2022
DOL	DOL		DANICA IVANOSKI		61 WILLETT ST. PASSAIC NJ 07503	10/26/2016	10/26/2021
DOL	DOL		DARIAN L COKER		2610 SOUTH SALINA ST SUITE 2CSYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	DOL		DAVID MARTINEZ		C/O EMPIRE TILE INC 6 TREMONT COURTHUNTINGTON STATION NY 11746	03/08/2016	03/08/2021
DOL	NYC		DAVID WEINER		14 NEW DROP LANE 2ND FLOORSTATEN ISLAND NY 10306	11/14/2019	11/14/2024
DOL	DOL		DEBBIE STURDEVANT		29 MAPLEWOOD DRIVE BINGHAMTON NY 13901	02/21/2017	02/21/2022
DOL	AG		DEBRA MARTINEZ		31 BAY ST BROOKLYN NY 11231	03/28/2018	03/28/2023
DOL	DOL		DEDA GAZIVODAN		C/O DAKA PLUMBING AND H 2561 ROUTE 55POUGHQUAG NY 12570	02/19/2016	02/19/2021
DOL	DOL		DELPHI PAINTING & DECORATING CO INC		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL		DENNIS SCHWANDTNER		C/O YES SERVICE AND REPAI 145 LODGE AVEHUNTINGTON STATION NY 11476	08/09/2016	08/09/2021
DOL	DOL		DF CONTRACTORS OF ROCHESTER, INC.		1835 DAANSEN RD. PALMYRA NY 14522	05/16/2017	05/16/2022
DOL	DOL		DF CONTRACTORS, INC.		1835 DAANSEN RD. PALMYRA NY 14522	05/16/2017	05/16/2022
DOL	NYC		DIMITRIOS KOUTSOUKOS		C/O ASTORIA GENERAL CONTR 35-34 31ST STREETLONG ISLAND CITY NY 11106	09/02/2015	09/02/2020
DOL	NYC		DIMITRIOS TSOUMAS		35-12 19TH AVENUE ASTORIA NY 11105	08/02/2017	08/02/2022
DOL	DOL		DOMENICO LAFACE		8531 OSWEGO RD BALDWINVILLE NY 13027	02/03/2020	01/09/2023
DOL	DOL	*****3242	DONALD R. FORSAY	DF LAWN SERVICE	1835 DAANSEN RD. PALMYRA NY 14522	05/16/2017	05/16/2022
DOL	DOL		DONALD R. FORSAY		1835 DAANSEN RD. PALMYRA NY 14522	05/16/2017	05/16/2022
DOL	DOL		DORIS SKODA		C/O APCO CONTRACTING CORP 24 SOUTH MARYLAND AVENUEPORT WASHINGTON NY 11050	09/24/2012	09/02/2020
DOL	NYC	*****7404	DOSANJH CONSTRUCTION CORP		9439 212TH STREET QUEENS VILLAGE NY 11428	02/25/2016	02/25/2021
DOL	DOL		DOUGLAS L MALARKEY	MALARKEY CONSTRUCTI ON	64 VICTORIA DRIVE B INGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	NYC		DUARTE LOPES		66-05 WOODHAVEN BLVD. STE 2REGO PARK NY 11374	04/20/2017	04/20/2022
DOL	DOL		E C WEBB		6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	DOL	*****5175	EAGLE MECHANICAL AND GENERAL CONSTRUCTION LLC		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025

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DOL	DOL		EARL L WILSON	WILSON BROTHER DRYWALL CONTRACTORS	36 ABERSOLD STREET ROCHESTER NY 14621	08/31/2015	08/31/2020
DOL	DOL		EAST COAST PAVING		2238 BAKER RD GILLET PA 16923	03/12/2018	03/12/2023
DOL	NYC	*****4269	EAST PORT EXCAVATION & UTILITIES		601 PORTION RD RONKONKOMA NY 11779	11/18/2016	11/18/2021
DOL	DOL	*****0780	EMES HEATING & PLUMBING CONTR		5 EMES LANE MONSEY NY 10952	01/20/2002	01/20/3002
DOL	DOL	*****3270	EMPIRE TILE INC		6 TREMONT COURT HUNTINGTON STATION NY 11746	03/08/2016	03/08/2021
DOL	NYC	*****5917	EPOCH ELECTRICAL, INC		97-18 50TH AVE CORONA NY 11368	04/19/2018	04/19/2024
DOL	DOL	*****7403	F & B PAINTING CONTRACTING INC		2 PARKVIEW AVENUE HARRISON NY 10604	09/26/2016	09/26/2021
DOL	DOL		FAIGY LOWINGER		11 MOUNTAIN RD 28 VAN BUREN DRMONROE NY 10950	03/20/2019	03/20/2024
DOL	DOL		FAY MATTHEW		C/O CHAMPION CONSTRUCTION 2131 SCHENECTADY AVENUEBROOKLYN NY 11234	11/18/2015	11/18/2020
DOL	DOL		FAZIA GINA ALI-MOHAMMED	C/O CHAMPION CONSTRUCTION	2131 SCHENECTADY AVENUE BROOKLYN NY 11234	11/18/2015	11/18/2020
DOL	DOL		FRANK BENEDETTO		19 CATLIN AVE JAMESTOWN NY 14701	09/17/2018	09/17/2023
DOL	DOL		FRANK BENEDETTO		C/O F & B PAINTING CONTRA 2 PARKVIEW AVENUEHARRISON NY 10604	09/26/2016	09/26/2021
DOL	DOL	*****4722	FRANK BENEDETTO AND CHRISTOPHER J MAINI	B & M CONCRETE	19 CAITLIN AVE JAMESTOWN NY 14701	09/17/2018	09/17/2023
DOL	NYC		FRANK MAINI		1766 FRONT ST YORKTOWN HEIGHTS NY 10598	01/17/2018	01/17/2023
DOL	NYC	*****6616	G & G MECHANICAL ENTERPRISES, LLC.		1936 HEMPSTEAD TURNPIKE EAST MEDOW NY 11554	11/29/2019	11/29/2024
DOL	DOL		GABRIEL FRASSETTI			04/10/2019	04/10/2024
DOL	DOL		GALINDA ROTENBERG		C/O GMDV TRANS INC 67-48 182ND STREETFRESH MEADOWS NY 11365	06/24/2016	06/24/2021
DOL	DOL		GEOFF CORLETT		415 FLAGGER AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
DOL	DOL		GIGI SCHNECKENBURGER		261 MILL RD EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	DOL		GIOVANNI LAFACE		8531 OSWEGO RD BALDWINSVILLE NY 13027	02/03/2020	01/09/2023
DOL	NYC	*****3164	GLOBE GATES INC	GLOBAL OVERHEAD DOORS	405 BARRETTO ST BRONX NY 10474	05/31/2018	05/31/2023
DOL	DOL	*****5674	GMDV TRANS INC		67-48 182ND STREET FRESH MEADOWS NY 11365	06/24/2016	06/24/2021
DOL	NYC		GREAT ESTATE CONSTRUCTION, INC.		327 STAGG ST BROOKLYN NY 11206	10/10/2017	10/10/2022
DOL	DOL		GREGORY S. OLSON		P.O BOX 100 200 LATTA BROOK PARKHORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL		HANS RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	NYC		HARMEL SINGH		15 CLINTON LANE HICKSVILLE NY 11801	02/25/2016	02/25/2021
DOL	NYC		HAROLD KUEMMEL		58-83 54TH STREET MASPETH NY 11378	02/26/2016	02/26/2021
DOL	NYC	*****3228	HEIGHTS ELEVATOR CORP.		1766 FRONT ST YORKTOWN HEIGHTS NY 10598	01/17/2018	01/17/2023
DOL	DOL		HENRY VAN DALRYMPLE		2663 LANTERN LANE ATLANTA GA 30349	12/01/2015	12/01/2020
DOL	DOL	*****8282	IDEMA DEVELOPMENT INC		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020

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DOL	DOL	*****8282	IDEMA GENERAL CONTRACTORS INC		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL	*****7001	INTEGRATED CONSTRUCTION & POWER SYSTEMS INC		SUITE 100 2105 W GENESEE STREETS YRACUSE NY 13219	01/06/2016	01/06/2021
DOL	DOL	*****5131	INTEGRITY MASONRY, INC.	M&R CONCRETE	722 8TH AVE WATERVLIET NY 12189	06/05/2018	06/05/2023
DOL	DOL		IRENE KASELIS		32 PENNINGTON AVE WALDWICK NJ 07463	05/30/2019	05/30/2024
DOL	AG		J A M CONSTRUCTION CORP		SUITE 125 265 SUNRISE HIGHWAY ROCKVILLE CENTRE NY 10457	04/07/2016	04/07/2021
DOL	DOL		J.A. HIRES CADWALLADER		P.O BOX 100 200 LATT A BROOK PARK HORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL		JAMES B RHYNDERS		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL		JAMES C. DELGIACCO		722 8TH AVE WATERVLIET NY 12189	06/05/2018	06/05/2023
DOL	DOL		JAMES E RHYNDERS		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	AG		JAMES FALCONE		SUITE 125 265 SUNRISE HIGHWAY ROCKVILLE CENTRE NY 10457	04/07/2016	04/07/2021
DOL	DOL		JAMES LIACONE		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
DOL	DOL		JAMES RACHEL		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
DOL	DOL		JAMES RHYNDERS SR		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL		JASON W MILLIMAN		C/O ROCHESTER ACOUSTICAL P O BOX 799 HILTON NY 14468	02/19/2016	02/19/2021
DOL	DOL	*****5368	JCH MASONRY & LANDSCAPING INC.		35 CLINTON AVE OSSINING NY 10562	09/12/2018	09/12/2023
DOL	NYC		JENNIFER GUERRERO		1936 HEMPSTEAD TURNPIKE EAST MEADOW NY 11554	11/29/2019	11/29/2024
DOL	DOL		JESSICA WHITESIDE		C/O BRRESTORATION NY INC 140 ARCADIA AVENUE OSWEGO NY 13126	09/12/2016	09/12/2021
DOL	AG		JOHN ANTHONY MASSINO		36-49 204TH STREET BAYSIDE NY 11372	02/07/2018	02/07/2023
DOL	DOL		JOHN F. CADWALLADER		200 LATT A BROOK PARK HORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL	*****4612	JOHN F. CADWALLADER, INC.	THE GLASS COMPANY	P.O BOX 100 200 LATT A BROOK PARK HORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL		JOHN GOCEK		14B COMMERCIAL AVE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	AG	*****0600	JOHNCO CONTRACTING, INC.		36-49 204TH STREET BAYSIDE NY 11372	02/07/2018	02/07/2023
DOL	DOL		JON E DEYOUNG		261 MILL RD P.O BOX 296 EAST AURORA NY 14052	07/29/2015	07/29/2020
DOL	DOL		JON E DEYOUNG		261 MILL RD P.O BOX 296 EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	DOL		JORI PEDERSEN		415 FLAGER AVE #302 STUART FL 34994	10/31/2018	10/31/2023
DOL	DOL		JOSE CHUCHUCA		35 CLINTON AVE OSSINING NY 10562	09/12/2018	09/12/2023
DOL	AG		JOSEPH FALCONE		SUITE 125 265 SUNRISE HIGHWAY ROCKVILLE CENTRE NY 10457	04/07/2016	04/07/2021
DOL	NYC		JOSEPH FOLEY		66-05 WOODHAVEN BLVD. STE 2 REGO PARK NY 11374	04/20/2017	04/20/2022
DOL	DOL	*****9273	JOSEPH M LOVETRO		P O BOX 812 BUFFALO NY 14220	08/09/2016	08/09/2021
DOL	NYC		JOSEPH MARTINO		1535 RICHMOND AVENUE STATEN ISLAND NY 10314	12/13/2017	12/13/2022
DOL	DOL		JOY MARTIN		2404 DELAWARE AVE NIGARA FALLS NY 14305	09/12/2018	09/12/2023
DOL	DOL		JULIUS AND GITA BEHREND		5 EMES LANE	11/20/2002	11/20/3002

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DOL	DOL	*****5062	K R F SITE DEVELOPMENT INC		375 LAKE SHORE DRIVE PUTNAM VALLEY NY 10579	01/23/2017	01/23/2022
DOL	NYC		K.S. CONTRACTING CORP.		29 PHILLIP DRIVE PARSIPPANY NJ 07054	02/13/2017	02/13/2022
DOL	DOL		KATIE BURDICK		2238 BAKER RD GILLETT PA 16923	03/12/2018	03/12/2023
DOL	DOL		KENNETH FIORENTINO		375 LAKE SHORE DRIVE PUTNAM VALLEY NY 10579	01/23/2017	01/23/2022
DOL	DOL	*****9732	KENT HOLLOW SIDING LLC		29A BRIDGE STREET NEW MILFORD CT 06776	01/15/2016	01/15/2021
DOL	DOL		KIM SOROCENSKI		C/O SOLUTION MATTERS INC 198 NORWOOD ROADPORT JEFFERSON NY 11776	11/19/2015	11/19/2020
DOL	DOL	*****3490	L & M CONSTRUCTION/DRYWALL INC.		1079 YONKERS AVE YONKERS NY 10704	08/07/2018	08/07/2023
DOL	DA	*****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	AG	*****4643	LALO DRYWALL, INC.		221 OLD FORD ROAD NEW PLATZ NY 12561	05/20/2016	05/20/2021
DOL	DOL	*****4505	LARAPINTA ASSOCIATES INC		29 MAPLEWOOD DRIVE BINGHAMTON NY 13901	02/21/2017	02/21/2022
DOL	DOL		LAVERN GLAVE		161 ROBYN RD MONROE NY 10950	01/30/2018	01/30/2023
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	06/24/2016	09/19/2022
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	06/24/2016	09/19/2022
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	01/17/2017	09/19/2022
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	08/14/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	08/14/2017	08/14/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	01/17/2017	09/19/2022
DOL	DA	*****4460	LONG ISLAND GLASS & STOREFRONTS, LLC		4 MANHASSET TRL RIDGE NY 11961	09/06/2018	09/06/2023
DOL	AG	*****4216	LOTUS-C CORP.		81-06 34TH AVENUE APT. 6EJACKSON HEIGHTS NY 11372	02/07/2018	02/07/2023
DOL	NYC		LUBOMIR PETER SVOBODA		27 HOUSMAN AVE STATEN ISLAND NY 10303	12/26/2019	12/26/2024
DOL	AG		LUIS MARTINEZ	LALO DRYWALL	211 MAIN ST. NEW PALTZ NY 12561	05/20/2016	05/20/2021
DOL	NYC		M & L STEEL & ORNAMENTAL IRON CORP.		27 HOUSMAN AVE STATEN ISLAND NY 10303	12/26/2019	12/26/2024
DOL	DOL		M ANVER BEIG		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	AG	*****6957	M B DIN CONSTRUCTION INC		8831 20TH AVENUE/SUITE 6E BROOKLYN NY 11214	11/17/2015	11/17/2020
DOL	DOL		M. ANVER BEIG		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	NYC	*****9590	MACK GLASSNAUTH IRON WORKS INC		137 LIBERTY AVENUE BROOKLYN NY 11212	12/21/2015	12/21/2020
DOL	DOL	*****1784	MADISON AVE CONSTRUCTION CORP		39 PENNY STREET WEST ISLIP NY 11795	11/02/2016	11/02/2021

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DOL	DOL		MALARKEY'S BAR & GRILL LLC		64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL	*****0705	MALARKEY'S PUB & GRUB LLC		64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
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	NYC		MAREK FABIJANOWSKI		50 MAIN ST WHITE PLAINS NY 10606	01/04/2019	01/04/2024
DOL	DOL		MARIACHI'S PIZZERIA		C/O DOUGLAS L MALARKEY 64 VICTORIA DRIVEBINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL		MARK MIONIS		6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	NYC		MARTINE ALTER		1010 NORTHERN BLVD. GREAT NECK NY 11021	03/09/2017	03/09/2022
DOL	DOL		MARVIN A STURDEVANT		29 MAPLEWOOD DRIVE BINGHAMTON NY 13901	02/21/2017	02/21/2022
DOL	DOL		MASONRY CONSTRUCTION, INC.		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	*****3333	MASONRY INDUSTRIES, INC.		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	NYC		MATINA KARAGIANNIS		97-18 50TH AVE CORONA NY 11368	04/19/2018	04/19/2023
DOL	DOL		MATTHEW IDEMA GENERAL CONTRACTORS INC		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL		MATTHEW P. KILGORE		4156 WILSON ROAD EAST TABERG NY 13471	03/26/2019	03/26/2024
DOL	DOL		MAURICE GAWENO		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	*****6416	MCCALL MASONRY		P O BOX 304 SAYRE PA 18840	08/09/2016	08/09/2021
DOL	DOL		MCLEAN "MIKKI BEANE"		1229 JAMES STREET SYRACUSE NY 13203	05/02/2017	05/02/2022
DOL	DOL		MCLEAN "MIKKI" DRAKE		1229 JAMES STREET SYRACUSE NY 13203	05/02/2017	05/02/2022
DOL	DOL		MCLEAN M DRAKE-BEANE		1229 JAMES STREET SYRACUSE NY 13203	05/02/2017	05/02/2022
DOL	DOL	*****9445	MCLEAN M WALSH	ELITE PROFESSIONAL PAINTING OF CNY	1229 JAMES STREET SYRACUSE NY 13203	05/02/2017	05/02/2022
DOL	DOL	*****9445	MCLEAN M WALSH	ELITE PROFESSIONAL PAINTING OF CNY	1229 JAMES STREET SYRACUSE NY 13203	05/02/2017	05/02/2022
DOL	NYC	*****5330	METRO DUCT SYSTEMS INC		1219 ASTORIA BOULEVARD LONG ISLAND CITY NY 11102	04/16/2014	11/19/2020
DOL	DOL		MICHAEL A PASCARELLA		SUITE 100 2105 WEST GENESEE STREET SYRACUSE NY 13219	01/06/2016	01/06/2021
DOL	NYC		MICHAEL HIRSCH		C/O MZM CORP 163 S MAIN STREETNEW CITY NY 10956	01/28/2016	01/28/2021
DOL	DOL		MICHAEL LENIHAN		1079 YONKERS AVE UNIT 4YONKERS NY 10704	08/07/2018	08/07/2023
DOL	AG		MICHAEL RIGLIETTI		31 BAY ST BROOKLYN NY 11231	03/28/2018	03/28/2023
DOL	DOL		MICHAEL WILSON	WILSON BROTHER DRYWALL CONTRACTORS	36 ABERSOLD STREET ROCHESTER NY 14621	08/31/2015	08/31/2020
DOL	DOL	*****4829	MILESTONE ENVIRONMENTAL CORPORATION		704 GINESI DRIVE SUITE 29MORGANVILLE NJ 07751	04/10/2019	04/10/2024
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	AG		MOHAMMED N CHATHA		8831 20TH AVENUE/SUITE 6E BROOKLYN NY 11214	11/17/2015	11/17/2020
DOL	DOL	*****2737	MOUNTAIN'S AIR INC		2471 OCEAN AVENUE- STE 7A	09/24/2012	09/18/2020

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DOL	NYC	*****3826	MOVING MAVEN OF NY, INC.		1010 NORTHERN BLVD. GREAT NECK NY 11021	03/09/2017	03/09/2022
DOL	NYC	*****3550	MOVING MAVEN, INC		1010 NORTHERN BLVD. GREAT NECK NY 11021	03/09/2017	03/09/2022
DOL	AG		MSR ELECTRICAL CONSTRUCTION CORP.		31 BAY ST BROOKLYN NY 11231	03/28/2018	03/28/2023
DOL	DOL		MUHAMMAD BEIG		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	DOL		MUHAMMAD BEIG		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	DOL		MUHAMMAD PERVAIZ		C/O CHAMPION CONSTRUCTION 2131 SCHENECTADY AVENUEBROOKLYN NY 11234	11/18/2015	11/18/2020
DOL	NYC	*****3613	MZM CORP		163 S MAIN STREET NEW CITY NY 10956	01/28/2016	01/28/2021
DOL	DA	*****9786	NATIONAL INSULATION & GC CORP		180 MILLER PLACE HICKSVILLE NY 11801	12/12/2018	12/12/2023
DOL	NYC	*****4839	NEW YORK RIGGING CORP		58-83 54TH STREET MASPETH NY 11378	02/26/2016	02/26/2021
DOL	NYC		NICHOLAS FILIPAKIS		7113 FORT HAMILTON PARKWA BROOKLYN NY 11228	12/09/2016	12/09/2021
DOL	DOL	*****6966	NORTH COUNTRY DRYWALL AND PAINT		23167 COUNTY ROUTE 59 DEXTER NY 13634	10/24/2016	10/24/2021
DOL	DOL	*****0065	NORTHEAST LANDSCAPE AND MASONRY ASSOC		3 WEST MAIN ST/SUITE 208 ELMSFORD NY 10523	01/23/2017	01/23/2022
DOL	DOL	*****1845	OC ERECTERS, LLC A/K/A OC ERECTERS OF NY INC.		1207 SW 48TH TERRACE DEERFIELD BEACH FL 33442	01/16/2018	01/16/2023
DOL	NYC	*****0818	ONE TEN RESTORATION, INC.		2366 61ST ST BROOKLYN NY 11204	12/15/2016	12/15/2021
DOL	NYC		ORSON ARROYO		C/O METRO DUCT SYSTEMS 12-19 ASTORIA BOULEVARDLONG ISLAND CITY NY 11102	04/16/2014	11/19/2020
DOL	NYC		PARESH SHAH		29 PHILLIP DRIVE PARSIPPANY NJ 07054	02/13/2017	02/13/2022
DOL	NYC	*****9422	PELIUM CONSTRUCTION, INC.		22-33 35TH ST. ASTORIA NY 11105	12/30/2016	12/30/2021
DOL	DOL		PETER M PERGOLA		3 WEST MAIN ST/SUITE 208 ELMSFORD NY 10523	01/23/2017	01/23/2022
DOL	DOL		PIERRE LAPORT		224 COUNTY HIGHWAY 138 BROADALBIN NY 12025	03/07/2017	03/07/2022
DOL	DOL	*****1543	PJ LAPORT FLOORING INC		224 COUNTY HIGHWAY 138 BROADALBIN NY 12025	03/07/2017	03/07/2022
DOL	NYC	*****5771	PMJ ELECTRICAL CORP		7113 FORT HAMILTON PARKWA BROOKLYN NY 11228	12/09/2016	12/09/2021
DOL	DOL	*****0466	PRECISION BUILT FENCES, INC.		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	NYC	*****4532	PROFESSIONAL PAVERS CORP.		66-05 WOODHAVEN BLVD. REGO PARK NY 11374	04/20/2017	04/20/2022
DOL	DA	*****6817	QUADRANT METAL BUILDINGS LLC		2740 SW MARTIN DOWNS BLVD PALM CITY FL 34990	08/25/2016	08/25/2021
DOL	NYC		RAMESHWAR ASU		137 LIBERTY AVENUE BROOKLYN NY 11212	12/21/2015	12/21/2020
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	01/30/2018	01/30/2023
DOL	AG	*****7015	RCM PAINTING INC.		69-06 GRAND AVENUE 2ND FLOORMASPETH NY 11378	02/07/2018	02/07/2023
DOL	DOL		REGINALD WARREN		161 ROBYN RD MONROE NY 10950	01/30/2018	01/30/2023
DOL	NYC	*****3461	RELIANCE GENERAL CONSTRUCTION INC		644 OCEAN PARKWAY BROOKLYN NY 11230	09/02/2015	09/02/2020
DOL	DA		RIANN MULLER		2740 SW MARTIN DOWNS BLVD PALM CITY FL 34990	08/25/2016	08/25/2021
DOL	DOL	*****9148	RICH T CONSTRUCTION		107 WILLOW WOOD LANE CAMILLUS NY 13031	11/13/2018	11/13/2023
DOL	DOL		RICHARD MACONE		8617 THIRD AVE BROOKLYN NY 11209	09/17/2018	09/17/2023

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DOL	DOL		RICHARD REGGIO		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	DOL	*****9148	RICHARD TIMIAN	RICH T CONSTRUCTI ON	108 LAMONT AVE SYRACUSE NY 13209	10/16/2018	10/16/2023
DOL	DOL		RICHARD TIMIAN JR.		108 LAMONT AVE SYRACUSE NY 13209	10/16/2018	10/16/2023
DOL	DOL		RICHARD TIMIAN JR.		108 LAMONT AVE SYRACUSE NY 13209	11/13/2018	11/13/2023
DOL	DOL		ROBBYE BISSEsar		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	01/11/2003	01/11/3003
DOL	DOL		ROBERT A. VALERINO		3841 LANYARD COURT NEW PORT RICHEY FL 34652	07/09/2019	07/09/2024
DOL	DOL		ROBERT BRUNO		3 GAYLORD ST AUBURN NY 13021	11/15/2016	11/15/2021
DOL	DOL		ROBERT BRUNO		5 MORNINGSIDE DRIVE AUBURN NY 13021	05/28/2019	05/28/2024
DOL	NYC		ROBERT HOHMAN		149 FIFTH AVE NEW YORK NY 10010	12/29/2016	12/29/2021
DOL	DOL	*****3859	ROCHESTER ACOUSTICAL CORP		P O BOX 799 HILTON NY 14468	02/19/2016	02/19/2021
DOL	DOL		RODERICK PUGH		404 OAK ST SUITE 101SYRACUSE NY 13203	07/23/2018	07/23/2023
DOL	DOL	*****4880	RODERICK PUGH CONSTRUCTION INC.		404 OAK ST SUITE 101SYRACUSE NY 13203	07/23/2018	07/23/2023
DOL	NYC		RODNEY SCOTT		201 HEMPSTEAD AVE WEST HEMPSTEAD NY 11552	10/30/2015	10/30/2020
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	01/30/2018	01/30/2023
DOL	DOL		RONALD MESSEN		14B COMMERCIAL AVE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL		ROSEANNE CANTISANI			06/12/2018	06/12/2023
DOL	DOL		RYAN ALBIE		21 S HOWELLS POINT ROAD BELLPORT NY 11713	02/21/2017	02/21/2022
DOL	DOL	*****3347	RYAN ALBIE CONTRACTING INC		21 S HOWELLS POINT ROAD BELLPORT NY 11713	02/21/2017	02/21/2022
DOL	DOL	*****1365	S & L PAINTING, INC.		11 MOUNTAIN ROAD P.O BOX 408MONROE NY 10950	03/20/2019	03/20/2024
DOL	DOL	*****7730	S C MARTIN GROUP INC.		2404 DELAWARE AVE NIAGARA FALLS NY 14305	09/12/2018	09/12/2023
DOL	NYC		SABIR MUHAMMED		SUITE B-8 782 PELHAM PARKWAY SOUTHBRONX NY 10462	04/21/2016	04/21/2021
DOL	DOL		SALVATORE A FRESINA			08/26/2016	08/26/2021
DOL	DOL		SAM FRESINA			08/26/2016	08/26/2021
DOL	NYC	*****0349	SAM WATERPROOFING INC		168-42 88TH AVENUE APT.1 AJAMAICA NY 11432	11/20/2019	11/20/2024
DOL	NYC		SANDEEP BOPARAI		185-06 56TH AVE FRESH MEADOW NY 11365	10/17/2017	10/17/2022
DOL	NYC	*****2117	SCOTT ELECTRICAL SERVICE, LLC.		201 HEMPSTEAD AVE WEST HEMPSTEAD NY 11552	10/30/2015	10/30/2020
DOL	DOL	*****9751	SCW CONSTRUCTION		544 OLD ROUTE 23 ACRE NY 12405	02/14/2017	02/14/2022
DOL	AG		SERGIO RAYMUNDO		109 DUBOIS RD. NEW PALTZ NY 12561	05/20/2016	05/20/2021
DOL	NYC	*****6597	SHAIRA CONSTRUCTION CORP.		421 HUDSON STREET SUITE C5NEW YORK NY 10014	02/20/2019	02/20/2024
DOL	DOL	*****1961	SHANE BURDICK	CENTRAL TRAFFIC CONTROL, LLC.	2238 BAKER ROAD GILLET PA 16923	03/12/2018	03/12/2023
DOL	DOL		SHANE BURDICK		2238 BAKER ROAD GILLET PA 16923	03/12/2018	03/12/2023
DOL	DOL		SHANE NOLAN		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
DOL	DOL		SHULEM LOWINGER		11 MOUNTAIN ROAD 28 VAN BUREN DRMONROE NY 10950	03/20/2019	03/20/2024
DOL	DOL	*****0816	SOLAR ARRAY SOLUTIONS.		9365 WASHINGTON ST	07/23/2018	07/23/2023

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DOL	DOL	*****4025	SOLUTION MATTERS INC		198 NORWOOD ROAD PORT JEFFERSON NY 11776	11/19/2015	11/19/2020
DOL	DOL	*****2221	SOUTH BUFFALO ELECTRIC, INC.		1250 BROADWAY ST BUFFALO NY 14212	02/03/2020	02/03/2025
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	*****9933	STEED GENERAL CONTRACTORS, INC.		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL		STEFANOS PAPASTEFANOU, JR. A/K/A STEVE PAPASTEFANOU, JR.		256 WEST SADDLE RIVER RD UPPER SADDLE RIVER NJ 07458	05/30/2019	05/30/2024
DOL	DOL	*****9751	STEPHEN C WAGAR		544 OLD ROUTE 23 ACRE NY 12405	02/14/2017	02/14/2022
DOL	DOL		STEVE TATE		415 FLAGER AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	NYC		STEVEN GOVERNALE		601 PORTION RD RONKONKOMA NY 11779	11/18/2016	11/18/2021
DOL	DOL		STEVEN MARTIN		2404 DELWARE AVE NIAGARA FALLS NY 14305	09/12/2018	09/12/2023
DOL	DOL		STEVEN P SUCATO		15-68 208TH STREET BAYSIDE NY 11360	06/23/2016	06/23/2021
DOL	DOL		STEVEN TESTA		50 SALEM STREET - BLDG B LYNNFIELD MA 01940	01/23/2017	01/23/2022
DOL	NYC	*****9432	SUBLINK LTD		346 THIRD AVENUE PELHAM NY 10803	11/19/2015	11/19/2020
DOL	NYC	*****5863	SUKHMANY CONSTRUCTION, INC.		185-06 56TH AVE FRESH MEADOW NY 11365	10/17/2017	10/17/2022
DOL	DOL	*****1060	SUNN ENTERPRISES GROUP, LLC		370 W. PLEASANTVIEW AVE SUITE 2.329HACKENSACK NJ 07601	02/11/2019	02/11/2024
DOL	DOL	*****8209	SYRACUSE SCALES, INC.		158 SOLAR ST SYRACUSE NY 13204	01/07/2019	01/07/2024
DOL	DOL		TALAILA OCAMPA		1207 SW 48TH TERRACE DEERFIELD BEACH FL 33442	01/16/2018	01/16/2023
DOL	DOL	*****9852	TAP STEEL INC		ROUTE 26 3101 P O BOX 457CONSTABLEVILLE NY 13325	01/28/2016	01/28/2021
DOL	DOL		TERRY THOMPSON		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025
DOL	DOL		TEST		P.O BOX 123 ALBANY NY 12204	05/20/2020	05/20/2025
DOL	DOL	*****5570	TESTA CORP		50 SALEM STREET - BLDG B LYNNFIELD MA 01940	01/23/2017	01/23/2022
DOL	DOL	*****5766	THE COKER CORPORATION	COKER CORPORATIO N	2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	DOL	*****8174	THE DALRYMPLE CORPORATION		UNIT 278 541 10TH STREET NWATLANTA GA 30318	12/01/2015	12/01/2020
DOL	DOL	*****8174	THE DALRYMPLE GROUP LLC		289 JONESBORO RD/ STE 216 MCDONOUGH GA 30253	12/01/2015	12/01/2020
DOL	DOL		TIMOTHY A PALUCK		C/O TAP STEEL INC RTE 26 3101/ P O BOX 457CONSTABLEVILLE NY 13325	01/28/2016	01/28/2021
DOL	DOL	*****3453	TORCHIA'S HOME IMPROVEMENT		10153 ROBERTS RD SAUQUOIT NY 13456	08/09/2016	08/09/2021
DOL	DOL	*****8311	TRIPLE B FABRICATING, INC.		61 WILLETT ST. PASSAIC NJ 07503	10/26/2016	10/26/2021
DOL	DOL	*****9407	TURBO GROUP INC		15-68 208TH STREET BAYSIDE NY 11360	06/23/2016	06/23/2021
DOL	DOL	*****6392	V.M.K CORP.		8617 THIRD AVE BROOKLYN NY 11209	09/17/2018	09/17/2023
DOL	NYC		VALERIE VISCONTI		346 THIRD AVENUE PELHAM NY 10803	11/19/2015	11/19/2020
DOL	NYC	*****7361	VIABLE HOLDINGS, INC.	MOVING MAVEN	1010 NORTHERN BLVD. GREAT NECK NY 11021	03/09/2017	03/09/2022
DOL	DOL		VICTOR ALICANTI		42-32 235TH ST DOUGLASTON NY 11363	01/14/2019	01/14/2024
DOL	DOL		VICTOR ROTENBERG		C/O GMDV TRANS INC 67048 182ND STREETFRESH MEADOWS NY 11365	06/24/2016	06/24/2021
DOL	NYC		VIKTAR PATONICH		2630 CROPEY AVE	10/30/2018	10/30/2023

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DOL	DOL		VIKTORIA RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	NYC		VITO GARGANO		1535 RICHMOND AVE STATEN ISLAND NY 10314	12/13/2017	12/13/2022
DOL	NYC	*****3673	WALTERS AND WALTERS, INC.		465 EAST AND THIRD ST MT. VERNON NY 10550	09/09/2019	09/09/2024
DOL	DOL		WAYNE LIVINGSTON JR	NORTH COUNTRY DRYWALL AND PAINT	23167 COUNTY ROUTE 59 DEXTER NY 13634	10/24/2016	10/24/2021
DOL	DOL	*****3296	WESTERN NEW YORK CONTRACTORS, INC.		3841 LAYNARD COURT NEW PORT RICHEY FL 34652	07/09/2019	07/09/2024
DOL	DOL		WHITE PLAINS CARPENTRY CORP		442 ARMONK RD	06/12/2018	06/12/2023
DOL	DOL		WILLIAM C WATKINS		1229 JAMES STREET SYRACUSE NY 13203	05/02/2017	05/02/2022
DOL	DOL		WILLIAM DEAK		C/O MADISON AVE CONSTR CO 39 PENNY STREETWEST ISLIP NY 11795	11/02/2016	11/02/2021
DOL	DOL	*****6195	WILSON BROTHER DRYWALL CONTRACTORS		36 ABERSOLD STREET ROCHESTER NY 14621	08/31/2015	08/31/2020
DOL	DOL	*****4043	WINDSHIELD INSTALLATION NETWORK, INC.		200 LATTA BROOK PARK HORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL	*****4730	XGD SYSTEMS, LLC	TDI GOLF	415 GLAGE AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	DOL	*****7345	YES SERVICE AND REPAIRS CORPORATION		145 LODGE AVE HUNTINGTON STATION NY 11476	08/09/2016	08/09/2021
DOL	DOL		YURIY IVANIN		C/O MOUNTAIN'S AIR INC 2471 OCEAN AVENUE-STE 7ABROOKLYN NY 11229	09/24/2012	09/18/2020
DOL	NYC		ZAKIR NASEEM		30 MEADOW ST BROOKLYN NY 11206	10/10/2017	10/10/2022
DOL	NYC	*****8277	ZHN CONTRACTING CORP		30 MEADOW ST BROOKLYN NY 11206	10/10/2017	10/10/2022

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 journeyman 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 within 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 trusted 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: _____
PRESIDENT

DATE: _____

BY: _____
VICE-PRESIDENT

DATE: _____

BY: _____
SECRETARY-TREASURER

DATE: _____

{INSERT NAME OF CONTRACTOR}

BY: _____
(Name & Title)

DATE: _____

**APPROVED BY:
COUNTY OF WESTCHESTER**

BY: _____
Commissioner of Public Works and Transportation

DATE: _____

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

SECTION 024119 - SELECTIVE REMOVALS

Applicable provisions of the Conditions of the Contract and Division 1, General Requirements, govern work in this section.

1. GENERAL

1.1 DESCRIPTION OF WORK

- A. The work of this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all demolition work for this project as required by the schedules, keynotes and drawings, including, but not limited to the following:

General Items of Work:

1. Remove existing site paving, underground utilities, plantings and structures, building walls, doors, windows, railings, trim, kitchen equipment, cabinets, finishes, toilet fixtures and piping, HVAC equipment and piping, electrical equipment and wiring, and the like. Remove existing North Driveway stairs, ramp, railings, door for Alternate Three.
2. Protect all existing spaces, finishes, and equipment designated to remain from damage during the demolition operations required by the scope of work of this Project.
3. Perform balance of all demolition and removal work as required by the drawings and existing conditions, including performing of all necessary cutting, removals, and the like for the proper installation of all new work.
4. Roofing and related flashing removals are described in Section 070150.
5. Removal of Asbestos-containing Material is described in Section 028000.

1.3 REQUIREMENTS AND RESTRICTIONS

- A. All work of this section will be accomplished in strict conformance to applicable provisions of the Local and/or State codes as may be applicable and OSHA Code requirements governing demolition work.
- B. Do all demolition work only at such times and in such a manner as is approved by the owner and is in compliance; with above referenced codes, documents, procedures, plans or instructions.

Noise shall be held to a minimum when working in or around functioning areas.

- C. The work of this section shall be accomplished by a Contractor experienced in demolition work on projects of similar size and complexity within the past 5 years.

Evidence of such experience on 5 such projects shall be submitted to the Owner for his

evaluation.

- D. Notify the Owner if work affects suspected asbestos-containing or lead based materials and request direction.

1.4 SUBMITTALS

- A. Submit schedule of demolition procedures to the Architect and obtain approval thereof before starting any work. Strict dust control measures shall be implemented and maintained.
- C. Permits, as applicable, for transport and disposal of debris and hazardous materials.

1.5 SAFETY AND PROTECTION

- A. Carefully protect all work adjacent to areas in which work is to be done and areas used for access.

Protect all floors where traffic requires it with suitable "rigid" protection material.

- B. During the progress of the work take every precaution to avoid accidents and to protect the work, the occupants of the building, the employees of the Owner and the public against damage and injury.

Where materials are stored in public areas or where work is in progress, protect same with fences, sheds, suitable barriers or guard rails and place electric lights on them at night.

2. PRODUCTS - NOT USED

3. EXECUTION

3.1 INSPECTION & VERIFICATION OF CONDITIONS

- A. Examine all drawings covering the work of this Section and refer to all other drawings, including mechanical and electrical drawings, which may affect the work of this section or require coordination by this trade.
- B. Visit the site, verify all conditions covering or affecting the work of this Section.
- C. Before starting any work, make a thorough examination of those portions of the structure on which the work is to be performed to insure that areas to be demolished are unoccupied and discontinued in use.
- D. Do not commence work until conditions are acceptable to Architect and/or Owner's Representative.

NOTE - Failure to acquaint oneself with all known or apparent conditions will not be cause for extra compensation.

Coordinate with "Conditions".

3.2 SALVAGE (Coordinate with Section 01010)

- A. Prior to the actual start of demolition and removal operations, the Contractor and the Owner's Representative shall inspect the overall premises for equipment and accessories to be salvaged including both those shown on the Drawings and such additional items as may be required by the owner.
- B. All items designated to be saved will be tagged in a suitable manner for disposition.
- C. Carefully remove all such items to be reused, stored and the like and store same where directed by the Architect &/or Owner.
- D. Replace marred or damaged items without cost to the Owner.

3.3 DEMOLITION

- A. Do no demolition or remove any items until it is certain that a condition will not be created which might jeopardize the weather-tightness or structural adequacy of the existing building.
- B. Demolish masonry walls and structural elements in small sections.
- C. Proceed with the work of demolition and removal in an orderly manner and without noise or other disturbance to the operations of the existing facility.

3.5 RECYCLING AND DISPOSAL (Coordinate with Section 017419)

- A. Remove all debris and refuse materials from the work area each night
- B. Rubbish shall not be allowed to accumulate. Remove rubbish from job site each day and leave premises and work in a clean condition. Loose rubbish shall not be piled on or near the premises. The Owner's refuse facilities shall not be used and rubbish shall not be placed in Owner's dumpsters, garbage or rubbish containers or the like. Location of rubbish containers shall be as directed by the County.
- C. Fires for burning of rubbish and debris or any other purposes are forbidden.
- D. All materials resulting from the demolition operations shall become the property of the Contractor and he shall dispose of all debris OFF THE SITE.

Hazardous materials are to be transported and disposed of by a licensed toxic-waste transporter in accordance with applicable Local, State and/or Federal regulations. Most stringent regulations shall govern.

- E. No storage of materials resulting from the demolition operations will be permitted on the site.

END OF SECTION 024119

SECTION 025000 – REMOVAL AND DISPOSAL OF LEAD CONTAMINATED MATERIAL

PART 1 GENERAL

1.1 WORK OF THIS SECTION

A. The work in this section includes:

1. Removal and Disposal of all lead paint as necessary to prepare all surfaces and materials to be painted. Paint was tested for lead by an accredited laboratory. Lab results indicated that many areas of existing paint was positive for lead.
2. Removal and disposal of painted wood trim and shakes as required for window and door and railing replacement.

A. Applicable requirements of the Information of Bidders and General Clauses.

A. The Contractor shall meet the licensing and certification requirements of the Federal State and local regulatory agencies, and shall have a Competent Person in control on the job site at all times during work. This person must comply with applicable Federal, State and Local regulations, which mandate work practices, and be capable of performing the work of this contract. The work specified herein shall be the performance of activities to control and eliminate lead-based paint hazards. These activities include interim controls, abatement, and encapsulation.

B. The Contractor shall use the services of an Environmental Monitoring firm with certified Inspector or Inspector Risk Assessor to monitor the work on behalf of Westchester County and an independent Laboratory and all air sampling and analysis shall be performed by parties not involved with the project.

The laboratory used for analysis shall be one recognized by EPA , for the selected methodology of sampling and analysis of lead, Such laboratory shall be accredited by either the American Industrial Hygiene Association, (AIHA) or by the American Association for Laboratory accreditation (AALA) which have been recognized by EPA, as laboratory-accrediting organizations participating in NLLAP.

The selected Laboratory shall be independent of the lead abatement contractor involved in the removal and disposal of Lead contaminated materials.

C. Restore all work areas and auxiliary areas utilized during abatement to conditions equal to or better the original. Any damage caused during the performance of abatement activities shall be repaired by the Contractor at no additional expense to the County. The contractor is responsible for protecting all objects remaining in the work areas that are permanent fixtures or too large to remove.

D. The Contractor shall be responsible for the following general requirements:

1. Obtain all applicable notifications, approvals and permits required.
2. Provide, erect, and maintain all staging, scaffolding, planking, bracing, shoring, barricades, and warning signs.

3. Unless otherwise specified, all removed materials and debris shall become the property of the Contractor and shall be removed from the premises. Materials not scheduled for re-use shall be removed from the site and disposed of in accordance with applicable Federal, State and Local requirements.
- E. Protect and preserve in operating condition, all utilities traversing the building and site. Damage to any utility due to work under this Contract shall be repaired to the satisfaction of the County at no cost to the County.

1.2 DESCRIPTION OF WORK

- A. The Contractor shall supply all labor, materials, equipment, services, insurance (with specific coverage for work on lead), and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations and these specifications.
- B. The lead abatement work shall include preparation for painting all surfaces and the total removal of lead painted wood siding and all related wood trim as required for window, door and railing replacement.

1.3 DEFINITIONS

Abatement – A measure or set of measures designed to permanently eliminate lead based paint hazards or lead based paint. Abatement strategies include the removal of lead based paint, enclosure encapsulation, replacement of building components coated with lead based paint, removal of lead contaminated dust, and removal of lead contaminated soil or overlaying soil with durable covering such as asphalt.

Action Level – Employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter calculated as an eight-hour time weighted average.

Abrasive Removal – A method of abatement that entails the removal of lead based paint using mechanical removal equipment fitted with a high efficiency particulate air (HEPA) dust collection system.

Atomic Absorption Spectrophotometer (AA) – An instrument which measures the lead content in parts per million (ppm) using lead source lamp and a flame capable of measuring the absorbed energy and converting it to concentration.

Biological Monitoring – The analysis of a person's blood to determine the level of lead contamination in the body.

Chemical Removal – A method of abatement which entails the removal of lead based paint using caustic or solvent based chemical paint strippers.

Competent Person – An individual who is capable of identifying existing and predictable lead hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them.

Complete Abatement – Abatement of all lead based paint inside or outside a dwelling or building and reduction of any lead contaminated dust or soil hazards. All of these strategies require prepa-

ration; clean up; post abatement clearance testing; record keeping; and, if applicable, reevaluation and on-going monitoring.

Deteriorated Paint – Paint that is peeling, flaking, chalking, scaling, or chipping; paint that is over a defective or deteriorated substrate; or paint that is damaged in any manner such that a child can get paint from the damaged area. Deteriorated paint shall be classified as either in fair condition or poor condition.

Elevated Blood Lead Level – A blood lead concentration equal to or greater than forty (40) micrograms per deciliter as defined in OSHA Standard 1926.62.

Encapsulation – The resurfacing or covering of surfaces, and sealing or caulking with durable materials so as to prevent or control chalking or flaking of substances containing lead based paint.

Enclosure – The use of rigid, durable construction materials that are mechanically fastened to the substrate to act as a barrier between the lead based paint and the environment.

Engineering Controls – Measures implemented at the work site to contain, control, and/or otherwise reduce worker exposure to, and environmental releases of lead dust and debris.

Evaluation – Risk assessment, paint inspection, reevaluation, investigation, clearance examination, or risk assessment screen.

Fixed Object – A unit of equipment or furniture in the work area which cannot, as determined by the County, be removed from the work area.

Hazardous Waste – As defined in the Resource Conservation and Recovery Act (RCRA) the term “hazardous waste” means a solid waste, or combination of solid wastes, which because of its quantity; concentration; or physical, chemical, or infectious characteristics may cause, or significantly contribute to increases in mortality, increases in serious and irreversible or incapacitating but reversible illness, or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed. As defined in the regulations, solid waste is hazardous if it meets one of four conditions:

1. Exhibits a characteristic of hazardous waste (40 CFR Sections 261.20 through 262.24),
2. Has been listed as hazardous (40 CFR Sections 261.31 through 261.33),
3. Is a mixture containing a listed hazardous waste and a non-hazardous solid waste (unless the mixture is specifically excluded or no longer exhibits any of the characteristics of hazardous waste), or
4. Is not excluded from regulation as a hazardous waste.

Inspection – A surface by surface investigation to determine the presence of lead based paint (in some cases including dust and soil sampling) and a report of the results.

Inspector – An individual who meets the Federal, State and Local certification requirements to (1) perform inspections to determine and report the presence of lead based paint on a surface by surface basis through on site testing, (2) report the findings of such an inspection, (3) collect environmental samples for laboratory analysis, (4) perform clearance testing, and (5) document successful compliance with lead based paint hazard control requirements or standards.

Intact Surface – A defect free surface with no loose, peeling, chipping, or flaking paint. Painted surfaces must be free from crumbling, cracking or falling plaster and not have holes in them. Intact surfaces must not be damaged in any way.

Interim Controls – A set of measures designed to temporarily reduce human exposure to lead based paint hazards. Such measures include specialized cleaning, repairs, maintenance painting, temporary containment, and management and resident education programs. Interim controls also include dust removal, paint film stabilization, treatment of friction and impact surfaces; installation of soil coverings, such as grass or sod; and land use controls.

Lead Abatement Plan – A written plan that identifies the location and defective lead based paint and describes how defective lead based surfaces will be abated and how the environment, health, and safety will be protected.

Lead Based Paint – Paint or other surface coatings that contain lead equal to or greater than 1.0 milligrams of lead per square centimeter or greater than 0.5% by weight.

Lead Based Paint Hazard – Any condition that causes exposure to lead from lead contaminated dust, lead contaminated soil, or deteriorated lead based paint would have an adverse effect on human health. Lead based paint hazards include for example, deteriorated lead based paint, leaded dust levels above applicable standards, and bare leaded soils above applicable standards.

Lead Based Paint Hazard Control – Activities to control and eliminate lead based paint hazards, including interim controls, abatement, and complete abatement.

Lead Based Paint Abatement Planner/Designer – An individual who meets the licensing and certification requirements of Federal, State, and Local requirements for planning and designing lead based paint abatement projects.

Lead Consultant – An individual who meets the licensing and certification requirements of Federal, State, and Local requirements to perform as an inspector, risk assessor or planner/designer.

Lead Control Area – An area where lead abatement operations are performed where airborne concentrations of lead dust exceed or can reasonably be expected to exceed the permissible exposure limit. The lead control area is isolated by physical boundaries from occupied areas to prevent the spread of lead dust, paint chips, debris, and unauthorized entry of personnel.

Lead Free Dwelling – A lead free dwelling contains no lead based painted surfaces and has interior dust and exterior soil lead levels below the applicable NYS DOH, HUD and EPA standards.

Lead Hazard Screen – A means of determining whether residences in good condition should have a full risk assessment. Also called a risk assessment screen.

Lead Safe Dwelling – A lead safe dwelling contains intact or encapsulated lead based paint and has interior dust levels below the applicable NYS DOH, HUD and EPA Standards.

Manifest – The shipping document (EPA Form 8700-22 or a comparable form required by the state or locality) used for identifying the quantity, composition, origin, routing, and destination of hazardous waste during its transport from the point of origin to the point of treatment, storage, or disposal.

Paint Film Stabilization – The process of wet scrapping, priming, and repainting surfaces coated with deteriorated lead based paint; paint film stabilization includes cleanup and clearance.

Paint Removal – An abatement strategy that entails the removal of lead based paint from the surfaces. For lead hazard work, this can mean using chemicals, heat guns below 700 degrees Fahrenheit, and certain contained abrasive methods. Open flame burning, open abrasive blasting, sand blasting, water blasting, and extensive dry scraping are prohibited paint removal methods.

Permissible Exposure Limit (PEL) – fifty (50) micrograms per cubic meter of air averaged over an 8 hour period as determined by 29 CFR 1926.62

Personal Monitoring – Sampling of lead concentrations within the breathing zone of a worker to determine the 8 hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employee's work tasks.

Reevaluation – In lead hazard control work the combination of visual assessment, and collection of environmental samples performed by a certified risk assessor to determine if a previously identified lead based paint hazard control is still effective and if the dwelling remains lead safe.

Replacement – A strategy of abatement that entails removing components such as windows, doors, and trim that have lead painted surfaces and installing new or de-lead components free of lead based paint.

Risk Assessment – A on site investigation of a residential dwelling to discover any lead based paint hazards. Risk assessments include an investigation of the age, history, management, and maintenance of the dwelling, and the number of children under age 6 and women of childbearing age who are residents; a visual assessment; limited environmental sampling (i.e., collection of dust wipe samples, soil samples, and deteriorated paint samples); and preparation of a report identifying acceptable abatement and interim control strategies based on specific conditions.

Risk Assessment Screen – A type of risk assessment performed only in buildings in good condition using fewer samples but more stringent evaluation criteria (standards) to determine lead hazards.

Risk Assessor, Inspector – An individual who meets the licensing and certification requirements of Federal, State, and Local standards to (1) perform risk assessments, (2) identify acceptable abatement and interim control strategies for reducing identified lead based paint hazards, (3) perform clearance testing and reevaluations, and (4) document the successful completion of lead based paint hazard control activities.

Toxicity Characteristic Leaching Procedure (TCLP) – Toxicity characteristic leaching procedure utilizing EPA test method SW-846, Method 1311 to determine whether waste can be classified as hazardous or construction waste for disposal purposes.

Visible Residue – Any paint debris, dust, or chips on surfaces within the work area where lead abatement has taken place and which is visible to the unaided eye.

Wet Cleaning – The process of eliminating lead dust and chip contamination from surfaces by using cloths, mops, or other cleaning tools which have been dampened with water and afterwards disposing of the cleaning items as hazardous waste.

Wipe Test – A test used to determine the concentration of lead particles; used to determine whether clearance levels for lead abatement have been achieved. A wipe test assimilates the dust from a measured surface area of about one square foot and is laboratory analyzed to determine the quantity of lead contained in that area.

X-ray Fluorescence (XRF) Analyzer – An analytical instrument which measures lead concentration of dried paint on surfaces or in a laboratory sample in milligrams per square centimeter using a radioactive source within the instrument. There are two types of XRF analyzers commonly available which require distinct and different testing protocols – “direct read” and “spectrum analyzer”

1.4 REFERENCES

- A. The current issue of each document shall govern. Where conflict among requirements or with these specifications exists, the more stringent requirements shall apply.

1. Occupational Safety and Health Administration (OSHA)

24 CFR 35 – Lead Based Paint Poisoning Prevention.

24 CFR 1910.134 – Respiratory Protection.

29 CFR 1910.146 – Permit-Required Confined Spaces.

29 CFR 1926.21 – Safety Training.

29 CFR 1926.28 – Personal Protective Equipment.

29 CFR 1926.55 – Gases, Vapors, Fumes, Dusts, and Mists.

29 CFR 1926.57 – Ventilation.

29 CFR 1926.59 – Hazard Communication.

29 CFR 1926.62 – Lead.

29 CFR 1926.103 – Respiratory Protection.

2. Environmental Protection Agency (EPA)

40 CFR 260 – Hazardous Waste Management Systems: General.

40 CFR 261 – Identification and Listing of Hazardous Waste.

40 CFR 262 – Generators of Hazardous Waste.

40 CFR 263 – Transporters of Hazardous Waste.

40 CFR 264 – Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

40 CFR 265 – Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

40 CFR 268 – Land Disposal Restrictions.

40 CFR 745 – Subpart F – Disclosure of Known Lead Based Paint and or Lead Based Paint Hazards Upon Sale or Lease of Residential Property.

40 CFR 745 – Subpart L – Lead Based Paint Activities.

40 CFR 745 – Subpart Q – State and Indian Tribal Programs.

3. Department of Transportation (DOT)

49 CFR 172 – Hazardous Materials Tables and Hazardous Materials Communications Regulations.

49 CFR 178 – Shipping Container Specification

4. Department of Housing and Urban Development (HUD)

Lead Based Paint; Guidelines for Evaluation and Control of Lead Based Paint Hazards in Housing.

1.5 SUBMITTALS:

Contractor shall submit the following documentation to ensure compliance with applicable regulations. An up to date copy shall be retained at the job site at all times.

A. Manufacturer's Catalog Data:

HEPA Vacuum Equipment
Respirators
Lead Specific Detergent
Lead Encapsulating Materials
Portable Shower Units and Hand Washing Facilities

B. Statements:

EPA Hazardous Waste ID Generator
Hazardous Waste Transport and Disposal Permits
Worker Training Certification
Worker Medical Certification
Worker Blood Lead Level
Worker Respiratory Fit Testing
Laboratory Certification
Safety Plan
Respirator Protection Plan
Hazard Communication Plan
Site Specific Lead Abatement Plan

C. a. Name, qualifications and licenses of OSHA competent persons meeting the requirements of 29 CFR 1926.62.

b. Documentation from a physician certifying that all employees who may be exposed to air borne dust in excess of the background level have been provided with an opportunity to be medically monitored to determine whether they are physically capable of working while wearing the respirator required without suffering adverse health affects. The physician shall have certified that each such worker has been found to be medically suited to perform LBP

abatement work, that the workers blood lead levels are less than 40 micrograms per deciliter and that the worker can wear a respirator and impervious garments while performing vigorous physical labor. In addition, document that personnel have received medical monitoring as required in 29 CFR 1926.62. They shall also be informed of the specific types of respirators the employee shall be required to wear and the work he/she will be required to perform as well as special work place conditions such as high temperature, high humidity, and chemical contaminants to which he/she may be exposed. Training certificates, licenses, respirator fit test certificate and medical records (including pre-abatement blood lead levels and medical clearance to wear a respirator) for each lead abatement worker shall be available.

- D. Documentation certifying that all employees have received training in the proper handling of materials that contain lead dust; understand the health implications and risks involved, including the illness possible from exposure to airborne lead dust fibers; understands the use and limits of respiratory equipment to be used; and understands the results of monitoring of airborne quantities of lead dust as related to health and respiratory equipment as indicated in 29 CFR 1926.62 on an initial and annual basis.
- E. Documentation of respiratory fit testing for all employees who must enter the Work Area. This fit testing shall be in accordance with qualitative procedures as detailed in 29 CFR 1926.62.
- F. Qualifications of the laboratory and person proposed for air sampling to assure workers are using appropriate respiratory protection in accordance with 29 CFR 1926.62. The Project Monitor shall be properly certified. Include the name and address of the testing laboratory proposed to perform air monitoring on behalf of the Contractor, along with their NYS-DOH ELAP I.D. number.
- G. Establish and supervise in accordance with 29 CFR 1926.21, a program for the education and training of workers in the recognition, avoidance and prevention of unsafe conditions and the regulations applicable to the work environment to control or eliminate any hazards or other exposure to illness and injury. Include any site specific information to address health and safety procedures unique to this project.
- H. Establish a written Respiratory Protection Plan in accordance with 29 CFR 1910.134. This plan shall establish procedures governing the selection and use of respirators and shall include such information as training in the proper use of respirators; medical examination of workers to determine or not they may be assigned an activity where respiratory protection is required; training in proper use and limitations of respirators; respirator fit testing; regular inspection and evaluation of the continued effectiveness of the program; and other elements included in the standard.
- I. Establish a written Hazard Communication Plan in accordance with 29 CFR 1910.1200(e) and 29 CFR 1926.59(e). This plan shall establish procedures describing how the facility will comply with the standard; describe how MSDSs will be obtained and made available for each hazardous chemical used in the work area; describe how information and training will be provided to employees; include a list of all toxic chemicals known to be present in the work place, cross referenced to the MSDS file; explain how workers will be informed of hazards connected with non-routine tasks, such as dealing with accidental spills and leaks; explain how workers will be informed of hazards associated with chemicals contained in unlabeled pipes; and contain information on how other contract employers will be informed about hazards their employees may encounter while working in the facility.
- J. Written description of lead abatement activities planned detailing methods, equipment, engineering controls, crew size, employee job responsibilities, operating and maintenance procedures.

K. Records:

Worker Medical Records (including pre and post-abatement blood-lead levels).
Workers Personal Air Sampling Results.
Certified Lead Waste Manifests.
TCLP Laboratory Results.

L. Emergencies

1. The Contractor shall develop procedures to be followed in the event of untoward circumstances including, but not limited to fire, electric shock, life-threatening bodily injury inside or outside of the work area, the detection of airborne lead levels that exceed the OSHA action level outside the work area or of level in the work area exceeding those for which respiratory protection has been provided, or splitting/spilling of lead waste bags in route to the waste truck.
2. Contact information, including a list of names and telephone numbers (with area codes) of the contractors contact persons, the fire department, police department, general emergency number (if used), and local hospital or similar emergency care unit shall be available to the contractors employees at all times work is performed. A copy of this emergency contact information is to be kept at the job site, available for inspection by the Contraction Officer and/or Authorized Visitors, and updated as required.

N. Disposal and Permits.

The contractor shall submit:

A disposal manifest verifying the final disposal of all removed lead containing materials at an approved waste disposal site before final payment is made.

Copies of all the required approvals and permits for disposal and transport of hazardous lead bearing waste including the HW identification number of the waste hauler.

Documentation that all required permits, licenses and other arrangements for transportation, treatment, storage and disposal and in accordance with applicable regulations in one or more approved sites have been obtained. Proof that hazardous waste treatment, storage, transportation and disposal complies with the Resource Conservation and Recovery Act (RCRA) requirements under 40CFR 260-299.

1.6 PERSONAL PROTECTION

- A. Prior to commencing work, Contractor must instruct all workers in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment, including procedures unique to this project. A formal respiratory protection program must be implemented in accordance with 29 CFR 1926.62.
- B. Contractor shall provide respiratory protection that will meet the requirements of OSHA as required in 29 CFR 1910.134 and 29 CFR 1926.62 and appropriate respiratory protection equipment for each worker. Contractor must ensure usage during potential lead dust exposure. Contractor must select respirators from among those jointly approved as being acceptable for protection by the Mine Safety and Health Administration (MSHA) and the National Institute of Occupational

Safety and Health (NIOSH) under the provisions of 30 CFR Part 11. Contractor must provide an adequate supply of filter elements on the job whenever required for respirators. In use.

- C. During the period of initial personal monitoring, personal exposure levels shall be presumed to be as specified in Table 1 with respiratory protection selected in compliance with Table 2. Following the initial personal monitoring period, Contractor must select respirators using Table 2 and the personal monitoring data. Conducting a lead abatement activity without the use of a respirator is not permitted...

TABLE 1

<u>ACTIVITY</u>	<u>PRESUMED EXPOSURE</u>
Removal of painted component	<50 µg/cubic meter
Manual demolition	<500 µg/cubic meter
Manual scraping	
Manual sanding	
Chemical removal	
Manual wire brushing	
Encapsulation	
Cleanup of chips, dust, or contaminated soil	
Shrouded power sanding, grinding, wire brushing or needle gun removal	
Abrasive Blasting	<2500 µg/cubic meter
Welding	
Cutting and Torch Burning	

TABLE 2

<u>Airborne Lead Dust Level</u>	<u>Required Respirator</u>
Not in Excess of 500 µg/cubic meter (10xPEL)	Half-mask air-purifying respirator equipped with HEPA filters.
Not in excess of 2,500 µg/cubic meter (50xPEL)	Full face piece power air-purifying res- pirator equipped with HEPA filters.

- M. Workers shall wear protective clothing in work areas where lead dust concentrations exceed permissible exposure limits established by OSHA. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings. Contractor shall ensure all contaminated protective clothing is disposed of as lead-contaminated waste. Launderable clothing must be handled and washed in accordance with 29 CFR 1926.62.
- N. Workers wearing half-mask respirators shall also wear safety glasses with side shields.
- O. Contractors must provide protective clothing impervious to caustic materials during chemical removal activity, gloves of neoprene composition during chemical removal activity, face shields when conducting chemical removal above eye level and organic vapor cartridges in addition to HEPA cartridges when conducting chemical removal activity.

1.7 DELIVERY, STORAGE AND HANDLING

Contractors must deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description. Do not use damaged or deteriorating material. Material that becomes contaminated with lead shall be decontaminated or disposed of as lead waste.

PART 2 MATERIALS

2.1 MINIMUM SPECIFICATIONS FOR MATERIAL

- A. Fire retardant polyethylene sheet in roll size to minimize the frequency of joints, shall be delivered to the job site with factory label indicating 6 mil.
- B. Tape shall be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces. Tape must be capable of adhering under both dry and wet conditions.
- C. Protective clothing used during chemical removal operations shall be impervious to caustic materials. Gloves used during chemical removal shall be of neoprene composition with glove extenders.
- D. Polyethylene disposable bags shall be six (6) mil and transparent in color.
- E. Detergent shall be a high phosphate content lead specific cleaning agent.
- F. Packaging
 - 1. Lead disposal packaging shall be suitable to receive and retain any lead-contaminated materials until disposal or conversion at an approved site. The packaging shall be both air and water tight.
 - 2. Packaging of hazardous waste material shall be packaged, labeled and marked and placarded (if required) in accordance with regulations of EPA (e.g. 40 CFR 262.30-33) and DOT (e.g. 49 CFR 172) and State or local occupational safety and health or environmental agencies where applicable, and this contract.

2.2 TOOLS AND EQUIPMENT

- A. Tools and equipment shall be suitable for lead removal:
- B. Air monitoring equipment shall be of the type and quantity required to monitor operations and conduct personnel exposure surveillance in accordance with OSHA requirements.
- C. Electrical equipment, protective devices and power cables shall conform to all applicable codes.
- D. Shower stalls and plumbing shall include sufficient hose length and drain system or an acceptable alternate. One shower stall shall be provided for each eight workers.
- E. Vacuum units, of suitable size and capabilities for the project, shall have HEPA filters capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of three micrometers in diameter or larger.

- F. Ladders and/or scaffolds shall be of adequate length, strength and sufficient quantity to support the work schedule. Scaffolds shall be equipped with safety rails and kick boards in compliance with OSHA requirements.
- G. For manual scraping activities, Contractors shall supply each worker with multiple newly sharpened scrapers on a daily basis.
- H. Other material such as lumber, nails and hardware necessary to construct and dismantle the decontamination enclosure and the barriers that isolate the work area shall be provided as appropriate for the work.
- I. Scaffolding and Staging shall meet OSHA safety regulations, including 29 CFR 1926.450-452.
- J. Electrical tools and equipment shall meet all applicable codes and regulations including in particular 29 CFR 1910.304(f) (5) (v) and 29 CFR 1926.400-449.
- K. Ground fault circuit-interrupters shall be used at all times for all electrical equipment, as permitted by the National Electrical Code (paragraph 215-9 Ground-Fault Protection for Personnel); unless an assured equipment grounding conductor program is established.

PART 3 REQUIRED CONTRACTOR EXECUTION

3.1 GENERAL REQUIREMENTS FOR LEAD ABATEMENT

- A. A Competent Person shall be on the job at all times to ensure the establishment of the work area from occupied areas, and proper work practices are followed through project completion.
- B. Contractor shall post warning signs meeting the requirements of OSHA 29 CFR 1926.62 at each work area. In addition, signs shall be posted at all approaches to areas so that employees may read the sign and take the necessary protective steps before entering the area.
- C. Contractor shall maintain emergency and fire exits from the building satisfactory to fire officials and the County.
- D. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extend of the conflict. Submit report to Owner's representative in written, accurate detail. Pending receipt of directive from Owner's representative rearrange selective removals schedule as necessary to continue overall job progress without delay.

3.2 WORKER PROTECTION

- A. Hygiene facilities shall be provided by Contractor as indicted in the individual work order.
- B. Contractor shall establish remote to the work area a worker decontamination enclosure consisting of equipment room, shower room, and clean room in series. Access between rooms in the worker decontamination enclosure shall be through double flap curtain openings. The shower room shall be of sufficient capacity to accommodate the lead abatement workers employed at the project. Supply warm water showers. Provide one shower for each eight workers. The change room and wash facilities shall be equipped with suitable hooks, lockers, shelves, etc., for workers to store

personal articles of clothing. Shower and wash water shall be collected, filtered, and disposed of as specified in paragraph 3.9.

- C. Contractor shall establish remote to the work area hand washing facilities. All workers shall wash prior to eating.
- D. No personnel shall be permitted to leave the work site or eat lunch unless first decontaminated by wet washing and HEPA vacuuming to remove all lead debris.
- E. No equipment shall be permitted to leave the work site unless first decontaminated by wet washing or HEPA vacuuming to remove all lead debris.

3.3 PREPARATION OF INTERIOR WORK AREAS

- A. Work area preparation level shall be as indicated in the individual work order. These levels correspond to tables 8.1 and 8.3 of the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.
- B. Seal off all openings including, but not limited to, windows, corridors, doorways, skylights, ducts, grills, diffusers, and any other penetration of the work areas, with polyethylene sheeting and seal with tape. Doorways and corridors which will not be used for passage during work must be sealed with barriers as required for separation of work area and occupied areas. Equip doors leading into the lead control area with 2 overlapping sheets of 6 mil polyethylene sheeting attached at the top and one side.
- C. Occupied areas and/or building space not within lead control areas shall be separated from lead abatement work areas by means of airtight barriers.
- D. Provide drop cloths to catch falling paint chips and chemical removal agents at interior work areas.
- E. Where floors are carpeted, preferentially remove carpeting following pre-cleaning and replace with new carpeting following abatement. Where replacement is not feasible, cover floor of work area, following pre-cleaning, with one layer of 6 mil polyethylene sheeting, duct taped securely at the perimeter.
- F. Remove the building component or the LBP by approved methods which will provide the least disturbance to the substrate material and the environment. The description of work attached to the project work order shall indicate the abatement strategy.
- G. Building components which have been removed shall be recycled where feasible.

3.4 PREPARATION OF EXTERIOR WORK AREAS

- A. Work area preparation level shall indicate in the individual work order. These levels correspond to tables 8.1, 8.2 and 8.3 of the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.
- B. For dry waste place 6mil polyethylene sheeting on the ground extending out from the foundation at least 5 feet and an additional 3 feet for each story to a maximum 20 feet. Secure at the founda-

tion by placing weights on the plastic. Erect vertical shrouds to contain any potential dust release into the adjacent environment.

- C. For liquid waste extend the end of the plastic a sufficient distance to contain the runoff and raise the edge of the sheets to trap liquid waste.
- D. Seal off all windows, openings, vents and HVAC equipment with critical barriers.
- E. Erect scaffolding, lifts or ladders adjacent to the exterior surface being abated.
- F. Cover all shrubs and bushes to prevent damage from liquid waste or dust.

3.5 SEPARATION OF LEAD WORK AREA FROM OCCUPIED AREAS

- A. Work areas separation shall be as indicated in the individual work order. These levels correspond to Table 8.1, 8.2 and 8.3 of the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.
- B. Contractor shall ensure that occupied areas and/or building space not within lead control areas shall be separated from lead abatement work areas by means of airtight barriers.
- C. Contractor shall ensure that all building exits are not simultaneously impaired from any occupied building area.
- D. Contractor shall shut all windows on the face of the building where lead paint removal is occurring and seal all air conditioners intake grates and vents on the face of the building where lead paint removal is occurring.

3.6 PROHIBITED PAINT REMOVAL METHODS

- A. The use of heat guns, or any blasting media, or power tool assisted grinding, sanding, cutting, or wire brushing without the use of HEPA vacuum dust collection systems to remove lead-based paint is prohibited.
- B. Welding or torch cutting materials painted with lead-based paint is prohibited. Where cutting, welding, rivet busting, or torch cutting of materials is required, prior removal of the lead-based paint shall be performed in the affected area.
- C. Dry scraping.

3.7 COMPONENT REPLACEMENT

- A. Contractor shall wet down components which are to be removed to reduce the amount of dust Generated during the removal process.
- B. Contractor shall remove components utilizing hand tools, and follow appropriate safety procedures during removal and remove the building component by approved methods which will provide the

least disturbance to the substrate material. Any damage to adjacent surfaces shall be repaired by Contractor at no expense to the County.

- C. Contractor shall initiate clean-up immediately after component removals have been completed and remove any dust located behind the component removed.

3.8 ENCAPSULATION

- A. Application of encapsulants to friction or impact surfaces is prohibited.
- B. All surfaces to be encapsulated shall be free of dirt, dust, mildew, scale, rust or other deleterious material. Contractor shall properly remove all loose or peeling paint, wash down the surface with a lead specific detergent and repair all substrate damage with an appropriate patching material.
- C. Prior to application of encapsulants, Contractor shall perform the tape, X-cut tape and patch tests in accordance with the HUD Guidelines to determine if the surface is suitable for encapsulation.
- D. Contractor shall follow the encapsulant manufacturer's printed application instructions.
- E. Any damage to adjacent surfaces shall be repaired by Contractor at no expense to the County.

3.9 DECONTAMINATION PROCEDURES

- A. All workers must wash upon leaving the work area. Wash facilities will be provided by the abatement Contractor in compliance with 29 CFR 1926.51(F) and 29 CFR 1926.62. This wash facility will consist of, at least, running water, towels, soap, and a HEPA vacuum. Upon leaving the work area, each worker will HEPA vacuum gross debris from work suit, remove and dispose of work suit, wash and dry face and hands, and vacuum clothes. Removal of lead chips or dust by blowing or shaking of clothing is prohibited. Wash water shall be collected, filtered, and disposed of in accordance with all applicable regulations.
- B. Operational shower facilities, remote to the Lead Control Area, shall be provided by the Contractor and maintained in working order such that any worker has the option of decontamination by showering. If air monitoring data by the Contractor or County's Inspector or risk assessor shows that employee exposure to airborne lead exceeds $50 \mu\text{g}/\text{m}^3$, the following mandatory showering conditions apply:
 - 1. Street cloths cannot be worn into the Lead Control Area and shall be stored in the change room. Workers shall wear disposable suits over clothing that stays on site in the change room, or disposable suits over nylon or Tyvek undergarments, or coveralls that are laundered on site.
 - 2. Street shoes cannot be worn into the Lead Control Area and shall be stored in the change room. Dedicated shoes that do not leave the Lead Control Area may be utilized. Work shoes covered by disposable booties may be utilized if the shoes are cleaned after each use and kept in the change room.
 - 3. Showers must be utilized.

- C. Contractor shall ensure that all persons who enter and leave the Lead Control Area follow proper entry and exit procedures for.

3.14 CLEANING

- A. Contractor shall remove and containerize all visible accumulations of paint chips and associated dust and debris. During clean-up Contractor will utilize rags and sponges wetted with lead-specific detergent and water to minimize dust levels.
- B. Mop heads, waste water, broom heads, rags, and sponges used in the clean-up activity shall be disposed of by Contractor as hazardous lead-bearing waste.
- C. Sealed disposal containers and all equipment used in the work area shall be included in the clean-up.
- D. Contractor shall clean all surfaces with HEPA filtered vacuum equipment prior to wet cleaning all surfaces within regulated area.
- E. **Daily Cleaning Requirements**
The work site shall be cleaned at the end of each day's abatement activities. HEPA vacuuming or wet sweeping shall be used to clean-up floors and other surfaces. All equipment shall be cleaned by HEPA vacuuming and high-phosphate or detergent washing before removing from the work area.
- F. **Cleaning Requirements Upon Completion of Work**
Cleaning shall start at the ceilings and working down to the floors, by vacuum cleaning using a HEPA vacuum, followed by a wet cleaning with high-phosphate (trisodium phosphate) or detergent wash. The contractor may use a garden or similar type low pressure sprayer to wet all surfaces with a 5% to 10% trisodium phosphate cleaning solution. After wetting a surface, wet and dry HEPA vacuum shall be used to vacuum the water from the surface. The waste water from cleanup shall be contained and disposed of according to this specification.
- G. All surfaces in the work area shall be cleaned of all residual dust, paint chips and debris.
- H. **HEPA Vacuum**
The contractor's workers that operate the HEPA vacuum shall obtain training in the use of the use of the HEPA vacuum from the manufacturer prior to use; The contractor shall use HEPA vacuum attachments, such as various size brushes, crevice tools, and angular tools for varied application and service the HEPA vacuum routinely to assure proper operation. Caution shall be used any time the HEPA is opened for filter replacement or debris removal. Operators shall wear a full set of protective clothing and equipment, or changing its bag or filter, The contractor shall bag and seal HEPA vacuum bags and filters in two 0.10mm (4mil) or on 0.15mm (6mil) plastic bags. Bags shall be labeled with OSHA lead warnings and DOT classification codes.
- I. **Large Debris**
Large debris from demolition shall be wrapped in plastic sheet at least 0.15mm (6mil) thick, sealed with heavy duct tape and stored in the designated area. This debris shall be removed according to this specification.

Small Debris

Prior to picking-up or collecting small debris, the surface to be cleaned shall be sprayed with a fine mist of water. The debris will be picked up, collected and placed into a single plastic bag at least 0.15mm (6 mil.) thick, or double bags or 0.10mm (4mil.) thick plastic. The bags shall not be overloaded, be securely tied and stored in the designated area until disposal.

Liquid Waste

The contractor shall contain and properly dispose of all liquid waste, including lead-contaminated water used in cleaning the abatement areas.

3.15 CLEARANCE

- A. A certified Inspector or Inspector Risk Assessor shall conduct all clearance testing inspections. Clearance dust sampling should be performed no sooner than 1 hour after completion of the final cleanup to permit the dust to settle.
- B. Visual Inspection Protocol: Visual inspection will verify the work has been completed and the area in which the work was performed does not have visible dust.
- C. Dust Sampling Protocol: For interior abatement in facilities scheduled for re-occupancy where documentation that the work area has been adequately cleaned to meet HUD Guideline clearance criteria use the following testing protocol:
 - 1. Following the final visual inspection, a properly certified Lead Inspector shall take lead wipe samples from within each room that has undergone interior lead abatement activity.
 - 2. Following wipe analysis, if lead dust levels are in excess of:
 - 40 micrograms of lead per square foot for floors
 - 250 micrograms of lead per square foot for window sills
 - 400 micrograms of lead per square foot for window wells

The Contractor shall repeat HEPA vacuuming and wet wiping the entire room. Repeat the testing and cleaning sequence until the standard for clearance has been achieved.
- D. For soil abatement or exterior abatement situations where documentation is desired Contractor shall use the following testing protocol:
 - 1. For contaminated soil abatement areas a certified inspector or risk assessor shall take post-abatement soil samples (one (1) composite samples for every 500 square feet of abated soil area randomly selected locations) and have the samples analyzed by automatic absorption for lead content. Samples shall be taken using a steel trowel to extract soil to a depth of four (4) inches. Three (3) randomly selected samples shall be taken from each 500 square foot area and the three (3) samples shall be mixed into one container for analysis.
 - 2. If any of the post-abatement soil samples exceed 2000 Parts per Million of lead analyze baseline soil samples to determine if the soil had a high lead level prior to the work.

3.16 WASTE DISPOSAL

- A. Disposal of hazardous lead bearing material must be in compliance with the requirements of, and authorized by the State of New York Department of Environmental Conservation and with the requirements of the Resource Conservation and Recovery Act. (RCRA), and with the requirements of the Environmental Protection Agency (EPA) – 40 CFR Part 261.
- B. **Testing Representative Lead Abatement Wastes**
The Contractor shall test representative lead abatement and demolition waste streams to determine if materials are regulated under RCRA, 40 CFR Part 261. The Contractor shall use TCLP to determine if the lead-contaminated material is covered under RCRA and must be disposed of as hazardous waste. If the TCLP determines that the lead concentration is 5.0 mg/L or greater, the waste must be regulated by RCRA, and must be contained properly and disposed as Hazardous Waste to either a Hazardous Waste Facility or a solid Waste Facility that accepts Hazardous Waste.
If the results indicate concentration of contaminants for the toxicity characteristic for lead, below 5.0 mg/L then, the waste can be disposed as Regular Construction / Industrial Debris.
- C. The following materials are likely to leach lead at hazardous levels in excess of 5 mg/liter. The Contractor shall containerize and dispose of the following materials as hazardous lead waste at an EPA approved treatment, storage, and disposal facility:
1. Paint Chips
 2. Paint Dust
 3. Sludge from chemical stripping
 4. Dust from HEPA filters and from damp sweeping
 5. Rags, sponges, mops, HEPA filters, respirator cartridges, scrapers, and other materials using for testing, abatement, and cleanup
 6. Disposable work clothes and respirator filters
 7. Contents of HEPA vacuums used on this project
 8. Polyethylene sheeting used during the course of chemical removal or heat gun removal
 9. All used duct tape
- D. Contractor shall transport the following materials generated during renovation activity to a scrap metal yard for recycling:
1. Any metal components painted with lead based paint
 2. Metallic lead components
- E. Contractors shall wipe the following materials clean of all dust, dirt, and debris and dispose of the material as construction debris:
1. Polyethylene sheeting used in abatement activities other than chemical or heat gun removal

- F. Contractor shall collect the wash water generated by the worker shower, wash facilities, or steam cleaning operations in 55 gallon drums for characterization and disposal after filtering the water using a 2 stage filtration system composed of:

1. 5 micron porosity in-line cartridge particulate filter followed by:
2. Activated carbon filter in-line cartridge

Contractor shall hold the filtered water for testing by the County's Inspector or Risk Assessor prior to discharge to the sanitary sewer. The County's Inspector or Risk Assessor shall test the water and verify lead levels below 0.1 parts per million (ppm) and Ph between 6 and 8 prior to discharge. If water test fails the testing criteria, it shall be treated with sodium hydroxide, Ph adjusted, and retested. If the second test fails the 0.1 parts per million (ppm) of water test, Contractor shall filter waste water by reverse osmosis prior to testing and discharge to the sanitary sewer.

- G. All hazardous lead waste shall be containerized by Contractor in accordance with 49 CFR 178. Contractor shall label and placard each container in accordance with 29 CFR 1926.62 and 49 CFR 172 to identify the type of waste and the date the container was filled.
- H. The Contractor may not store containerized hazardous lead waste on the job site for in excess of 90 calendar days from the accumulation start date.
- I. Contractor shall utilize a certified transporter for hazardous waste in compliance with DOT 49 CFR 172.
- J. Contractor shall submit the completed Uniform Hazardous Waste Manifest, EPA Form 8700-22 for each load of hazardous waste within 30 calendar days following the date the load leaves the site.
- K. Contractor Hazardous Waste Responsibilities
1. The Contractor shall properly transport, treat, store and dispose of lead-contaminated waste, and other hazardous wastes generated under the contract in accordance with all applicable regulations.
 2. The Contractor shall notify the National Response Center (800-424-8802) of the release of a reportable quantity of a hazardous substance generated.
 3. Insurance
The Contractor shall hold the County of Westchester harmless from any release or threat of release following its acceptance of any hazardous substance generated in accordance with the contract.

3.17 ADDITIONAL INSURANCE REQUIREMENTS

1. The successful bidder shall submit with their bid, copies of the Insurance Policies in the types and amounts as stipulated above in the Information for Bidders Section "Insurance Requirements". In addition to the "claims made" insurance policies, the contractor shall maintain a Lead Abatement General Liability Occurrence Policy, in amount not less than \$1,000,000 and naming owner as the certificate holder.

"The County of Westchester" must be included as an Additional Named

Insured under all insurance policies associated with this project.

2. The hauler carrying lead to the disposed site in addition to the types and amounts stipulated in the Information for Bidders Section "Insurance Requirements" shall carry "Sudden and Accidental Pollution" Liability Insurance in the amount not less than \$1,000,000. Endorsements to existing policy will be acceptable.

End of Section 025000

Established in 1995
NYS DOL Asbestos Handling License #28535
NYS DOL Mold Remedial Contractor License #00168
NYS DOL Mold Assessor License #00237
EPA Lead Paint Certification #NY-62470-2
NYS DEC Waste Transporter Permit #3A-812

Richard Stumbo
President

ENVIRONMENTAL MAINTENANCE CONTRACTORS, INC.

Environmental Consulting, Testing and Reporting Services

* Asbestos Testing and Removal * Lead Based Paint (XRF) Testing * Underground Storage Tank Removal Services*
* Indoor Air Quality Testing * Mold Abatement Service * Hazardous Material Testing and Abatement *
* Environmental Phase I and II Assessments *

December 9, 2016

Attn: Steven La Rocca, AIA LEED AP
La Rocca Greene Architects LLC
22 Purchase Street
Rye, NY 10580

Phone: (914) 967-3494 Fax: (914) 967-3376
Email: slarocca@laroccagreene.com

LIMITED LEAD TESTING REPORT

Environmental Maintenance Contractors, Inc. (EMC) has completed the Limited Lead Testing of readily accessible random painted surfaces within the interior and exterior of the Main House of Lasdon Park located at 2610 Amawalk Road, Somers, NY. The Limited Lead Testing was performed on March 1, 2016. The areas tested includes the interior and exterior of the building that may be impacted by the proposed "Lasdon Park Main House Renovation" project as per the La Rocca Greene Architects drawing, dated 12/07/09.

CREDENTIALS

Environmental Maintenance Contractors, Inc. (EMC's) NYS EPA Certified Lead Paint Inspector used a portable **Niton XLp 300A** X-Ray Fluorescence (XRF) Spectrum Analyzer for the purpose of testing selected painted surfaces for the presence of Lead (Pb)-containing paint and/or Lead-Based Paint (LBP). The XRF gives results in units of milligrams per square centimeter mg/cm² for each surface tested.

EMC's New York State Department of Labor, Division of Radiological Safety and Health Operators License is # 3179-4412.

EMC's Inspectors/Assessors/XRF Operators have been trained in the proper use and handling of this instrument. Each operator has completed the Niton users training course, and uses the instrument in accordance with all manufacturers' directives and methods.

XRF INSTRUMENTATION CREDENTIALS

Reference checks of the Niton XLp 300A Spectrum X-ray Fluorescence Analyzer against a test validation block (pre- and post-) at the time of testing indicated proper functioning of the instrument.

Calibration of the Niton instrument is performed by Niton at time of a source change or repair. Wipe tests to determine leakage are performed biannually and recent testing has determined that leakage of radiation from the instrument was below detectable levels and therefore, safe for usage in areas occupied by human life.

LEAD PAINT TESTING METHODS AND REPORTING

EMC performed Limited Lead Testing of readily accessible random painted surfaces utilizing a portable **Niton XLp 300A** X-Ray Fluorescence (XRF) Spectrum Analyzer to directly read milligrams (one thousandth of a gram) of Lead (Pb) per square centimeter (mg/cm²) of the tested surface area.

EMC, Inc. 5 Anderson Lane, Goldens Bridge, New York 10526, Tele: 914-232-7355, Fax: 914-232-7357
email: rstumbo@enviromain.com

EMC's definition of LBP in the context of this report is consistent with the following limits established by HUD as follows (used in this report for guidance purposes only):

Positive:	$\geq 1.0 \text{ mg/cm}^2$ (contains lead).
Negative:	$< 1.0 \text{ mg/cm}^2$ (below regulated levels).

The Niton XLp 300A eliminates the inconclusive range by analyzing a surface until either a positive or negative result is achieved at a 95% confidence limit.

Current state-of-the-art methods for inspecting for LBP are described by the U.S. Department of Housing and Urban Development (HUD) in "**Guidelines for the Evaluation and Control of LBP Hazards in Housing, June 1995**", referred to as the "HUD Guidelines". The HUD Guidelines are applicable to federally financed housing projects. EMC's lead testing methods follow those described in the Guidelines only to the extent applicable as determined in the field.

INTERPRETATIONS OF XRF DATA

Pb testing or XRF readings are provided on the attached XRF Data Sheets. As expectable for this analytical methodology, XRF values tend to vary slightly for lead detected in the same surface.

SCOPE OF SERVICES AND XRF TESTING METHODOLOGY

EMC was retained to perform a non-destructive Limited Lead Testing of readily accessible random painted surfaces. No penetrations or exploratory demolition was performed during the Limited Lead Testing to test painted surfaces including but not necessarily limited to, ceilings, walls and floor cavities.

Following client's directives and pursuant to and following the HUD Guidelines, EMC tested surfaces for the purpose of determining the presence of Pb-containing paint and/or LBP.

For the testing of paint, the threshold value used for guidance purposes was 1.0 milligrams of Pb in dried paint film per square centimeter of painted surface (mg/cm^2). **This is the level established and implemented by HUD as LBP.**

Representative surfaces were tested accordingly with the Niton XLp 300A Spectrum Analyzer in K & L shell mode. If the results from either the K or L shell reading for lead were less than 1.0 mg/cm^2 , the surface was recorded as not having a toxic concentration level of lead. The result of this measurement can be considered accurate to the stated +/- range as determined by the length of sampling until a confidence level of 95% is achieved.

If the results from either the K or L shell reading for lead were equal to or greater than 1.0 mg/cm^2 , the surface was recorded as having a toxic concentration level of lead. The result of this measurement can be considered accurate to the stated +/- range as determined by the length of sampling until a confidence level of 95% is achieved.

The Niton XLp 300A analyzes a surface for lead until a positive or negative result is achieved with a 95% confidence limit.

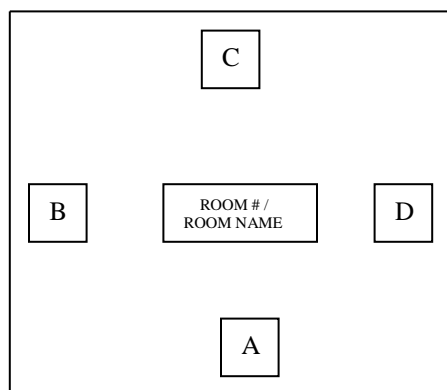
In addition to K & L shell readings the downloaded data reports a “Combined” reading column. This reading represents a “best fit” of either the K or L shell reading, thereby presenting to the inspector the most reliable testing data.

Results based upon the on-site measurements were then recorded by the instrument and downloaded to a desktop computer with all the pertinent information encoded into the instrument

DATA TABLE SPECIFICS

The XRF Readings data table accompanying this report lists the rooms inspected as room 1, room 2, room #, and/or room name, etc. (See attached diagram for details). In addition, the data table lists which side a structure and/or feature was tested on as either A, B, C, or D. These letters refer to wall directions instead of north, south, east, or west. Wall “A” is the wall containing the entry doorway into the specific room with the following letters assigned to walls going clockwise around the room (see diagram below).

WALL DIRECTION DIAGRAM



FINDINGS

The tested surfaces were found to have lead levels that exceeded “**REGULATORY STANDARDS**” as established by the HUD.

- Stair Components
- Window Components
- Ceiling
- Ceiling Hatch
- Wall
- Base Boards
- Drawers
- Door Components
- Closet Components
- Box Cover
- Elevator Components
- Shelving
- Fireplace Components
- Chair Rails
- Exterior Wall Shingles
- Porch Components (including exterior windows)
- Sinks
- Floor
- Crown Molding
- Arches
- Plaster
- Radiator Components
- Garage Door
- Piping
- Exterior Ceiling
- Exterior Columns
- Exterior Door Components

See XRF Data Sheets for exact details of surfaces and results.

INACCESSIBLE AREAS

N/A

DISCLAIMER

This report is for your exclusive use and is only to be used as a guide in determining the presence and condition of the **Pb-containing paint and/or LBP** in the building premises at the time of inspection.

This report is based solely upon a visual inspection of the premises at the time of testing and does not make any determinations with respect to portions of the premises which were not tested.

EMC, Inc. makes no representation of warranty with respect to your compliance with local, state, or federal statutes, regulations, or rules. This report sets forth relevant excerpts from manuals published by HUD. However, EMC, Inc. assumes no responsibility for the accuracy and adequacy of said excerpted material or future modifications of it.

Any and all liability on the part of EMC, Inc. shall be limited solely to the cost of this survey report. EMC, Inc. shall have no liability for any other damages, whether consequential, compensatory, punitive, or special, arising out of, incidental to, or as a result of this survey and/or report. EMC, Inc. assumes no liability for the use of this survey and/or report by any other person or entity than the customer for whom it has been prepared.

CONCLUSIONS and RECOMMENDATIONS

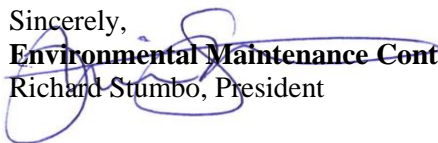
The Limited Lead Testing performed did identify painted surfaces that contain lead levels in excess of the HUD regulatory standards of 1.0 mg/cm², within the interior and exterior the Main House of Lasdon Park located at 2610 Amawalk Road, Somers, NY that may be impacted by the proposed "Lasdon Park Main House Renovation" project as per the La Rocca Greene Architects drawing, dated 12/07/09.

Please note that although some painted surfaces contain concentrations of lead (Pb) below 1.0 mg/cm², these components/surfaces could still create lead dust hazards if the paint is turned into dust by burning abrasion, scraping or sanding.

Any painted surfaces not tested as detailed in this report shall be treated as Pb-containing until tested to confirm otherwise.

Any work/activities performed that would disturb the lead painted components should be avoided. All work that would disturb Pb-containing paint and/or LBP building components should be performed by an OSHA trained personnel and/or EPA Certified Contractor utilizing appropriately trained Supervision and Labor, as applicable.

Should you have any questions or require additional information please do not hesitate to contact me @ 914-232-7355.

Sincerely,

Environmental Maintenance Contractors, Inc.
Richard Stumbo, President

Attachments: XRF Data Sheets and Certifications

EMC, Inc. 5 Anderson Lane, Goldens Bridge, New York 10526, Tele: 914-232-7355, Fax: 914-232-7357
email: rstumbo@enviromain.com

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Unless determined otherwise, all suspect asbestos containing building materials (ACM's) affected by the work under this Contract – Lasdon Park Main House Renovation Project at the Westchester County Lasdon Park located at 2610 Amawalk Road, Route 35, Somers, NY, hereafter referenced as the “Project” shall be considered as such and therefore treated as asbestos-containing and/or contaminated materials including all materials listed in Table 1. Refer to Drawings D1, D2, D3, D4, D5, D6, D7, D8. Drawings are only a diagrammatic representation of the work areas and do not constitute the actual quantities of materials. Asbestos Abatement Contractor is responsible for the confirmation of the actual total quantities of the materials prior submitting bid.

Table 1.

Asbestos Containing Materials (ACM's) Spreadsheet		
ACM Type	Location	Approximate Quantity
Wall Shingle Tar	Exterior Wall	1,700 Square Feet
Pipe Insulation	Basement Crawl Space	120 Linear Feet
Pipe Fitting Insulation	Entire Basement	170 Linear Feet
Flashing Tar	Entire Flat Roof and Shingle Roof Flashings	316 Square Feet
Tar on Parapet Wall	Entire Main Roof	21 Square Feet
Chimney Tar	All Chimneys	60 Square Feet
Floor Felt	3 rd Floor Bathroom	54 Square Feet
Window/Door Caulking	Entire Exterior	235 Square Feet

End of Table 1.

- B. The Abatement Contractor shall be responsible for verifying site conditions as well as the type and quantity of asbestos containing and/or asbestos contaminated materials to be abated / removed as part of the Project.
- C. The Abatement Contractor shall be responsible for removing all asbestos containing and/or contaminated materials under this Project. Any Demolition required to access all ACM's shall be performed by the Abatement Contractor as part of the pricing submitted.
- D. The Abatement Contractor shall be responsible for coordinating all daily activities

with the General Contractor and Third Party Air Monitoring Firm including the notice of cancellation of a work shift

- E. The contract amount shall include all costs associated with all asbestos abatement activities including labor for removal, disposal of waste generated, all applicable project filings and notifications, site specific variance applications, work permits, equipment, insurance, overhead, etc., as will be required to perform work in accordance with all applicable Federal (EPA), State (NYS DOL) and Local (City) regulations / requirements.
- F. The Work of this Section involves the removal of all asbestos containing and/or contaminated materials (ACM's) detailed in Table 1 for the Project. The removal of all ACM's are to be performed in accordance with the applicable Federal, State and Local requirements as well as this Abatement Specification, Building Owner/Client, Architect and the General Contractor's requirements.
- G. The Abatement Contractor shall provide the necessary equipment (i.e. scaffolding systems, ladders, etc.) to safely access the work areas.
- H. The Abatement Contractor will coordinate with the General Contractor for types and locations of containers for disposal of non asbestos materials as well as locations for storage, and transport of asbestos containing materials from the work areas.
- I. The Abatement Contractor shall remove all asbestos-containing materials impacted by the project as specified.
- J. During the Project, the Abatement Contractor shall not interfere with any on-going building operations in areas that are not within containment areas. All deliveries, storage of materials and location of the asbestos waste and hauling container(s) shall be coordinated with the General Contractor. The Abatement Contractor shall confine his equipment; the storage of materials or wastes and the operation of his workmen to limits established by law, ordinances, permits or directions of the General Contractor and shall not unreasonably encumber the premises with his materials apparatus or equipment.
- K. The Environmental Consultant and/or the Third Party Air Monitoring Firm retained by the Building Owner, commissioned to represent same as an authorized agent shall decide as to the meaning and applicability of any part of the technical abatement documents as it pertains to the asbestos abatement portion of the project, and its' decision shall be binding and final unless overruled by the Building Owner. The Environmental Consultant and/or the Third Party Air Monitoring Firm shall be responsible to administer instructions to the Abatement Contractor with respect to the meaning and implementation of all Contract Documents.
- L. Any omissions from this document or any mis-description of details of work that are manifestly necessary to carry out the intent of the work or that are customarily performed will not in any way relieve the Abatement Contractor from performing such omitted or mis-described details of work. The abatement work shall be performed as if fully and correctly set forth and described in the technical abatement document.

- M. In the event of a conflict with or overlap of the above referenced regulations or the technical work & test procedures document(s), the most stringent provisions shall be applicable. If a discrepancy occurs between the Abatement Contractor's standard operating procedure and this document, this document shall take precedence and supersede the directive in question.
- N. If one or more provisions of the technical abatement document shall be deemed inapplicable to any particular project for any reason, the portions so affected will be omitted and shall not affect the operability or applicability of remaining portions.
- O. Any waiver of any part of these technical abatement document(s), herein pursuant to the judgment of the Environmental Consultant shall be in writing and shall not operate as a waiver with respect to any other portions absent the written permission of the Environmental Consultant granting such waiver specifically to the Abatement Contractor, for the section of the requirements deemed waived.
- P. No claims are made as to the structural integrity of any of the areas on or in which abatement is proposed. It remains the sole responsibility of the bidding contractor to determine such parameters per abatement site. The Abatement Contractor shall also be responsible for the determination of the safe operations with regard to working loads on roof areas. Structural load tests, or determinations of similar parameters are to be done by a registered Professional Engineering firm, retained by the Abatement Contractor to perform any and all such tests necessary. If personal safety harnesses may be necessary for the worker involved phases of the work, again it shall be the Abatement Contractor's responsibility to administer all required safety precautions and procedures as per all applicable OSHA requirements.

1.2 RELATED DOCUMENTS:

- A. Provide insurance coverage and certificates as per Westchester County requirements stated in Information to Bidders, Article 7, page 2.3.

1.3 MATERIALS AND PRODUCTS:

- A. Encapsulant: Battelle Columbus Laboratory test procedures and rating requirements developed under the 1978 USEPA contract shall be used for lockdown encapsulation.
- B. Latex paint with solids content greater than 15% shall be considered a lockdown sealant for coating all non-metallic surfaces. Acceptable materials are Chil-Abate CP-210, Childer Products Company; Serpiflex Shield, International Protective Coatings Corp.; or approved alternate.
- C. Surfactant: Any surfactant used shall be non-carcinogenic and not generally toxic in normal use. Aqua-gro by Aquatrols Corporation or Asbestite 1000 by Arpin Products or approved equal shall be used.

1.4 PROTECTIVE EQUIPMENT:

- A. Minimum of half-faced respirators and replacement filters.
- B. Powered Air Purifying (PAPR) acceptable and recommended especially for full containment or amphibole asbestos.
- C. Tyvek suits or equivalent, gloves, boots, etc.

1.5 MISCELLANEOUS MATERIALS:

- A. Fire retardant polyethylene six-mil thickness (actual).
- B. Fire-rated wood framing (2- by 4-inch) and 3/8-inch plywood for decontamination enclosure system and isolation barriers.
- C. Personnel shower system with hot/cold water spigot with 5.0-micron filtration and disposal system.
- D. Hot water heater for personnel shower, should hot water be unavailable from inside the facility.

1.6 PROPOSED WORK SCHEDULE:

- A. The work shall be planned and completed in conjunction with the General Contractor and Building Owner's requirements. The Abatement Contractor shall provide a schedule with the total number of eight hour shifts required to complete the work outlined within this document with their bid.
- B. The schedule of abatement work shall be coordinated with the Owner, General Contractor and the Third Party Air Monitoring Firm.

NOTE: The Abatement Contractor will be the responsible party for notifying the Third Party Air Monitoring Firm and the General Contractor of any and all cancellations of work. This cancellation of the daily shift will be required to be made by 7:00 P.M. of the previous day. Any cancellations that result in costs to the Building Owner because of lack of proper notification shall be paid for by the Abatement Contractor.

PART 2 - SCOPE OF WORK

2.1 The Contractor shall remove and dispose of ACM's and be responsible for the following:

- A. Be responsible for conducting the removal in conjunction with the New York State Department of Labor Industrial Code Rule 56 (NYSDOL ICR 56) for the removal of the ACM's. All abatement activities are to be in accordance with applicable Federal, State and Local regulations including negative air and a centrally located cut-off switch (as applicable), fire retardant polyethylene and plywood sheeting, fire extinguishers, cleanings, critical barriers, exit and no smoking signs, etc.

- B. Be responsible for the preparation of the applicable filing applications, all associated fees required for the notifications and obtaining the appropriate permits, for all applicable Federal, State and Local regulatory agencies, in order to be in compliance with all applicable regulatory requirements.
- C. Be responsible for performing the work on this Project in compliance with applicable Federal, State, and Local regulations, permits, work place safety plans, variances, codes, standards and guidelines regarding asbestos abatement activities, except where more stringent requirements are set forth, where conflicting requirements are encountered, the more stringent requirements shall apply.
- D. Be responsible for determining all quantities of ACM's and/or asbestos contaminated materials that are to be removed/abated and disposed of as asbestos-containing materials.
- E. Be responsible for providing a licensed electrician for lock-out, tag-out of the electrical equipment, providing and connecting the GFI panel for the work area(s) and for supplying any construction lighting necessary to conduct this Project.
- F. Be responsible for providing a licensed plumber for any and all plumbing connections/disconnects and for any and all emergency plumbing repairs necessary during the course of this Project.
- G. Be responsible for assuring that all electrical connections and plumbing modifications are established "no less than 24-hours" prior to the commencement of the Project and for coordinating with the General Contractor for the removal of the GFI panel and re-establishing all electrical and all plumbing modifications within "24-hours" of the Project completion as applicable.
- H. Be responsible for supplying all necessary OSHA-approved ladders and worker fall protection training and equipment, which may become necessary or required to complete the Project.
- I. Be responsible for indicating and outlining their proposed filing of this Project (i.e. use of site specific variances, etc.) on their submission - form of bid.

PART 3 - DOCUMENT SUBMISSIONS

3.1 The Abatement Contractor shall be required to submit within ten (10) days prior to the pre-construction conference three copies of the documents listed within this Part. The Abatement Contractor must receive the Environmental Consultant's written approval of all submittals before any work associated with the Project may begin.

A. PROGRESS SCHEDULE:

- 1. Show the complete sequence of construction by activity and the sequencing of work within each area and section of the work.
- 2. Show the dates for the beginning and completion of each major element of work including substantial completion dates for each work area or phase, as applicable.
- 3. Show projected percentage of completion for each item, as of the first day of each month, as applicable.

4. Show final inspection dates.

B. NOTIFICATIONS:

Submit notifications required by Federal, State and Local agencies together with proof of timely transmittal to agencies (certified mail return receipt). Provide copies of return receipts, checks and filings to the General Contractor, Building Owner, Environmental Consultant and Third Party Air Monitoring Firm.

C. PERMITS:

Submit copies of current valid permits required by Federal, State and Local regulations, including arrangements for storage, transportation and disposal of contaminated material.

D. WORKER TRAINING AND MEDICAL SURVEILLANCE:

1. Documentation of worker training as required by OSHA 29 CFR 1926.58 for each person assigned to the Project, as well as any subcontractors employees assigned to the job.
2. "Asbestos Employee Medical Examination Statement", "Certificate of Worker Release" and "Asbestos Employee Training Statement" forms must be completed, signed and submitted for each worker assigned to the Project.
3. Documentation shall include valid NYS DOL and NYC DEP (as applicable) asbestos handling certificates, proof of respirator fit test and OSHA required medical examination.
4. Records of all employee training and medical surveillance shall be maintained for at least forty (40) years.

E. MSDS SHEETS:

The Abatement Contractor shall also submit Safety Data Sheet (SDS) to the Environmental Consultant for each type of chemical, liquid material, surfactant or encapsulant.

F. ABATEMENT CONTRACTORS LICENSES:

The Abatement Contractor shall submit proof of a current valid license issued by the New York State Department of Labor; the New York City Department of Environmental Protection (as applicable) and; all workers shall be required to have both NYS and NYC (as applicable) certifications/licenses on their person, while performing abatement activities, as required.

G. RESPIRATORY PROTECTION PROGRAM:

The Abatement Contractor shall submit a written Respiratory Protection Program to the Environmental Consultant for review and approval.

H. ABATEMENT PROJECT SUPERVISOR(s):

Provide the name, address and social security number of the person(s) who will be the NYS DOL Certified Asbestos Supervisor to supervise the abatement. The Abatement Contractor shall designate a full-time Abatement Supervisor who will be on-site at all times during work periods. The Abatement Supervisor must be able to read and write English fluently, as well as communicate with and direct his/her workers.

The Abatement Contractor shall submit the Abatement Supervisor's resume with the pre-work submittals for review and approval by the Environmental Consultant. The Abatement Supervisor must satisfy the "competent person" requirements as defined OSHA 1926.58 and shall demonstrate a minimum of two (2) years experience with work of similar nature.

I. SPECIMENS OF DAILY LOG:

Submit copies of typical daily logs from previous projects of similar scope and size.

J. WASTE DISPOSAL CONTRACTOR AND DISPOSAL SITE:

1. The name and address of the deposit landfill or waste disposal site or sites where the asbestos waste materials are to be deposited or disposed of. The Environmental Consultant must approve this site. The manifesting procedure must also be specified.
2. The name, address and copy of the New York State Dept. of Environmental Conservation Waste Transporter Permit of any transporters that are to be used to transport asbestos waste.

K. PATENTS, and/or TRADE LICENCES:

Please refer to the General Conditions/General Requirements of the Project Specifications for guidance on these matters.

L. SUBCONTRACTOR:

Submit a detailed list of subcontractors, trade, copies of their applicable licenses and necessary permits, if they are to be utilized on this project.

M. WORK PLAN:

1. Prior to commencing the abatement Project, the Abatement Contractor shall submit to the Environmental Consultant and General Contractor, a written standard operation procedure that is designed and implemented to maximize protection against human exposure to asbestos. The Standard Operational Procedures (SOP) shall take into consideration the workers, visitors, building employees, general public and environment. At a minimum, the procedures must include, as applicable, the following:

- a. Security to the worksite(s) shall be the responsibility and provided by the selected Abatement Contractor, on an around-the-clock basis against unauthorized visitors.
 - b. Delineation of responsibility of the work site including individual's names, addresses, telephone numbers and where they can be reached at all times, including weekends.
 - c. The Abatement Contractor shall designate and document a full time Asbestos Supervisor who shall be on-site at all times during abatement activities. If the Asbestos Supervisor is not on-site, all work shall be stopped. The Asbestos Supervisor shall remain until the project is complete and cannot be removed without the written consent of the Building Owner and the Environmental Consultant.
 - d. Samples of warning and tenant notifications and notices to be posted at the job site.
 - e. Catalog description of protective clothing and approved respirators, as well as, replacement equipment to be used.
 - f. Provide specimen copies of daily progress log, visitor's log, & disposal log.
 - g. Submit copies of all rental notices sent to rental suppliers informing them of the nature of the work that the Contractor intends to use the equipment for.
 - h. Description of all removal methods to be used, including HEPA air filtration and decontamination sequence with special emphasis on any procedure that may deviate from these specifications.
 - i. A detailed abatement plan, in triplicate, for the preparation of the work site showing work area (numbered sequentially) including the locations of critical barriers (if required), placement and number of negative air filtration units and exhausts including calculations (if necessary), decontamination chambers, dumpster(s), entry and exits to the work area, type of abatement activity/technique, and temporary office. The Contractor with the Owner must coordinate temporary office.
 - j. A list of manufacturer's certifications stating that all vacuums, negative air filtration equipment, respirators and air supply equipment meet OSHA and EPA requirements.
 - k. A list of all materials proposed to be furnished and used under this contract.
 - l. Work schedule, identifying firm dates and completion for actual areas. Bar chart or critical path chart indicating phases is required.
 - m. Emergency evacuation procedures for medical or safety (fire and smoke) and from accidents such as injuries from falls heat exposure, electrical shock, etc.
 - n. The name, address and license number of the New York State Certified and AIHA Accredited Analytical Testing Laboratory he proposes to use for the OSHA monitoring.
2. Submit statements signed by each employee stating that the employee has received training in the proper handling of asbestos containing materials; understands the health implications and risks involved and understands the use and limitation of the respiratory

equipment to be used.

3. Work may not commence until all above referenced documents have been reviewed and approved in writing by the Consultant and Client representative.

N. ON-SITE DOCUMENTATION:

1. The Abatement Contractor shall maintain within the decontamination unit a daily log documenting the dates and time of (but not limited to) the following items:
 - a. Meetings; purpose, attendees, discussion (brief)
 - b. Visitations; authorized and unauthorized
 - c. Personnel; name, entering and leaving the work area
 - d. Special or unusual events, barrier breaches, equipment failures, etc.
 - e. Air monitoring test results for OSHA Compliance. Verbal results shall be supplied within 24 hours of testing. Hard copies shall be supplied to the building manager within five (5) days of testing. Abnormalities shall be supplied to the building manager immediately.
2. Documentation with confirmation signature of Third Party Air Monitoring Firm representative of the following:
 - a. Inspection of work area preparation prior to start of removal and daily thereafter;
 - b. Removal of any polyethylene barriers Inspections prior to encapsulation;
 - c. Removal of waste materials and quantities. Decontamination of equipment (list items);
 - d. Final inspection/final air tests.

O. CLOSE-OUT DOCUMENTATION:

1. Provide records of all project information, to include the following that shall be submitted upon completion of the project and prior to approval of the Abatement Contractor's final payment:
 - a. The name, address and social security number of the person who supervised the asbestos project.
 - b. The location and description of the asbestos project.
 - c. Copies of all OSHA compliance air monitoring records conducted during work.
 - d. Copies of the daily progress log, visitor's log.

- e. Copies of any and all certificates of visual reviews.
- f. The amount of asbestos or asbestos material that is installed, removed, enclosed, applied, encapsulated, or disturbed.
- g. The name and address of the deposit or waste disposal site or sites where the asbestos waste materials were deposited or disposed of and all associated manifests, receipts and seals.
- h. The name and address of any transporters used to transport asbestos waste material or asbestos material and all related manifests, receipts and other documentation associated with the transport of asbestos waste.
- i. All other information that may be required by all Federal, State, and new Local regulations.
- j. The name, address, Asbestos Handler Certificate numbers, and Social Security Numbers of all persons engaged in the project.
- k. Copies of any required Employee Statements such as Medical Examination Statement, Certificate of Worker Release, or Employee Training Statement.

P. NOTIFICATIONS AND PERMITS

1. The Abatement Contractor shall be required to prepare and submit notifications and applicable work permits and work place safety plan to the following agencies at least ten (10) days prior to the commencement of the project:

US Environmental Protection Agency
DECA-ACB
290 Broadway, 21st floor
New York, NY 10007-1866

State of New Department of Labor
Asbestos Control Bureau
State Office Campus
Building 12, Room 454
Albany, New York 12240

New York City Department of Environmental Protection
Asbestos Control Program
59-17 Junction Boulevard, Flushing, N.Y. 11373

New York City Department of Buildings
c/o New York City Department of Environmental Protection and/or Local Fire District
Asbestos Control Program
59-17 Junction Boulevard, Flushing, N.Y. 11373
New York City Department of Buildings
c/o New York City Department of Environmental Protection

Asbestos Control Program
59-17 Junction Boulevard, Flushing, N.Y. 11373

2. The notifications shall include at a minimum, the following information:
 - a. Name and address of the Contractor;
 - b. Name of Consultant
 - c. Address and description of the building, including size, age, and prior use of the building or area, and the amount of asbestos material present;
 - d. Designate room numbers or location(s) information of abatement activity(s);
 - e. Scheduled starting and completion dates for removal;
 - f. Methods to be employed when removing asbestos-containing materials;
 - g. Procedures and equipment (including ventilating systems) that will be employed to comply with the Code of Federal Regulation (CFR) Title 40, Part 61 of the U.S. Environmental Protection Agency;
 - h. The name and address of the carting company and of the waste disposal site where the asbestos waste will be deposited.
 - i. Note: Notifications shall be submitted using standard forms as may be used by the respective agency and;
 - j. All required and applicable permits, work place safety plan as per the new NYCDEP Asbestos Rules and Regulations (implemented as of November 16, 2009).
3. The Contractor shall secure any and all permits required by the US EPA, the City of New York, county, or State of New York, that may be required with the cost for obtaining the permit included in the base bid price.
4. The Contractor shall erect bi-lingual warning signs around the workspace at every point of potential entry into the work area in accordance with OSHA 1926.58. These signs shall bear the following information:

**DANGER - ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE
CLOTHING ARE REQUIRED IN THIS AREA**

5. The Abatement Contractor shall post at entrances to the work place and immediate adjacent areas, notifications to building occupants which include the name of the Abatement Contractor, project location and size, amount and type of ACM, abatement procedures, dates of expected occurrence at least 10 days prior to the start of work as per

applicable NYSDOL regulations.

6. The Abatement Contractor shall post a list of all emergency telephone numbers at the job site which shall include the Consultant, Owner's Representative, police, emergency squad, local hospital, Environmental Protection Agency, New York State Department of Labor, Occupational Safety and Health Administration, local Dept. of Health., and as applicable; the Fire Department and Department of Buildings.

PART 4 – PRODUCTS AND STANDARDS

- 4.1 Applicable standards that pertain to these specifications are not limited to documents promulgated by the following agencies are as follows:

ANSI	American National Standards Institute 1430 Broadway New York, New York 10018 (212) 354-3300
ASHRAE	American Society for Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle NE Atlanta, Georgia 30329 (404) 636-8400
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, Pennsylvania 19103 (215) 299-5400
CFR	Code of Federal Regulations Available from Government Printing Office Washington, District of Columbia 20402
CGA	Compressed Gas Association 1235 Jefferson Davis Highway Arlington, Virginia 22202 (703) 979-0900
CS	Commercial Standard of NBS (US Dept. of Commerce) Government Printing Office
USEPA	United States Environmental Protection Agency 401 Main Street SW Washington, District of Columbia 20460 (202) 382-3949
FS	Federal Specification (General Services Administration) 7th and D Streets, SW Washington, District of Columbia 20406 (202) 472-2205
NBS	National Bureau of Standards (US Department of Commerce)

Gaithersburg, Maryland 20234
(301) 921-1000

NEC	National Electrical Code (by NFPA)
NFPA	National Fire Protection Association Batterymarch Park Quincy, MA 02269 (617) 770-3000
NYDOH	New York Department of Health
NYDEC	New York State Department of Environmental Conservation
NYSDOL	State of New York Department of Labor
NYCDEP	New York City Department of Environmental Protection
NYCDOB	New York City Department of Buildings
FDNY	New York City Fire Department
OSHA	Occupational Safety and Health Administration (US Department of Labor) Government Printing Office Washington, District of Columbia 20402
UL	Underwriters Laboratories 333 Pfingsten Road Northbrook, IL 60062 (312) 272-8800

4.2 Federal Regulations: Those which govern asbestos abatement work or hauling and disposal of asbestos waste materials include but are not limited to the following:

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA), including but not limited to:

Asbestos Regulations, Title 29, Part 1910, Section 1001 of the CFR

Respiratory Protection, Title 29, Part 1910, Section 134 of the Code of Federal Regulations

Construction Industry, Title 29, Part 1926, of the CFR.

Access to Employee Exposure & Medical Records, Title 29, Part 1910, Section 20 of the Code of Federal Regulations

Hazard Communication, Title 29, Part 1910, section 1200 of the Code of Federal Regulations

Specifications for Accident Prevention Signs and Tags, Title 29, Park 1910, Section 145 of the Code of Federal Regulations

U.S. Environmental Protection Agency (EPA) including but not limited to:

Asbestos Hazard Emergency Response Act, 40 CFR Part 763

Asbestos in Schools Hazard Abatement Reauthorization Act (ASHERA), 40 CFR Part 763

Worker Protection Rule, 40 CFR Part 763, Subpart G, CPTS 62044, FLR 2843-9,

Federal Register, Vol. 50, No. 134, 7/12/85, P28530-28540

Regulation for Asbestos, Title 40, Part 61, Subpart A of the Code of Federal Regulations

National Emission Standard for Asbestos, Title 40, Part 61, Subpart M (Revised Subpart B) of the Code of Federal Regulations

U.S. Department of Transportation (DOT) including but not limited to:

Hazardous Substances: Final Rule, Regulation 49 CFR, Part 171 and 172

State and Location Regulations:

Those which govern asbestos abatement work or hauling and disposal of asbestos waste materials include but are not limited to the following:

NYC Department of Sanitation (NYS DOS)

New York State Department of Environmental Conservation (DEC) Regulations regarding waste collection registration.

New York State Right-To-Know-Law

New York State DCA/Construction Codes

New York Dept. of Community Affairs, Construction Code.

4.3 Standards: Those which govern asbestos abatement work or hauling and disposal of asbestos waste materials include but are not limited to the following:

American National Standards Institute (ANSI)

Fundamentals Governing the Design and Operation of Local Exhaust Systems
Publication Z9.2-79

Practices for Respiratory Protection, Publication Z88.2-80

4.4 EPA Guidance Documents: Those that discuss asbestos abatement work, hauling and disposal of asbestos waste materials are listed below only for the Contractor's information.

These documents do not describe the work and are not a part of the work of this contract.

Guidance for Controlling Asbestos-Containing Materials in Buildings (Purple Book)
EPA560/5-85-024.

Asbestos Waste Management Guidance EPA 530-SW-85-007.

4.5 As used in or in connection with these specifications the following terms shall mean:

Abatement - Procedures to control fiber release from asbestos material. This includes removal, encapsulation and enclosure.

Aggressive sampling - A method of sampling in which the person collecting the air sample creates activity by the use of mechanical equipment during the sampling period to stir up settled dust and simulate activity in that area of the building.

AIHA - The American Industrial Hygiene Association, 475 Wolf Ledges Parkway, Akron, Ohio 44311.

Airlock - A system for permitting entrance and exit while restricting air movement between a containment area and an uncontaminated area. It consists of two curtained doorways separated by a distance of at least three feet such that one passes through one doorway into the airlock, allowing the doorway sheeting to overlap and close off the opening before proceeding through the second doorway, thereby preventing flow-through contamination.

Air sampling - The process of measuring the fiber content of a known volume of air collected during a specific period of time.

Amended water - Water to which a surfactant has been added.

Approved asbestos safety program - A program approved by the Commissioner of Health providing training in the handling and use of asbestos and asbestos material, education concerning safety and health risks inherent in such handling and use and training in techniques for minimizing exposure of the public to asbestos fibers, which shall include but not be limited to the requirements set forth in the specifications.

Area air sampling - Any form of air sampling or monitoring where the sampling device is placed at some stationary location.

Asbestos - Any naturally occurring hydrated mineral silicate separable into commercially usable fibers, including chrysotile (serpentine), amosite (cumingtonite-gunerite), crocidolite, tremolite, anthophyllite and actinolite.

Asbestos contract - A written agreement contained in one or more documents for the performance of work on asbestos project and includes all labor, goods and service.

Asbestos handler - An individual that installs, removes, applies, encapsulates, or encloses asbestos or asbestos material or who disturbs friable asbestos.

Asbestos handling certificate - A certificate issued by the Commissioner of Labor of the State of New York or the Commissioner of the Department of Environmental Protection (in New York City) to a person who has satisfactorily completed an approved asbestos

safety program.

Asbestos material - Any material containing one percent or more by weight of asbestos.

Asbestos project - Any form of work performed in connection with the alteration, renovation, modification demolition of a building or structure which will disturb more than 25 linear feet or ten square feet of friable asbestos material.

Asbestos Safety Technician (AST) -Designated to represent the Consultant at the job site during the removal program.

Asbestos waste material - Asbestos material or asbestos-contaminated objects requiring disposal.

Authorized visitor - The Building Owner, his or her representative or any representative of a regulatory or other agency having jurisdiction over the project.

Background level monitoring - A method used to determine airborne asbestos fiber concentrations inside and outside of a building or structure prior to starting an asbestos project.

Building Owner - The person in whom legal title to the premises is vested unless the premises are held in land trust, in which instance Building Owner means the person in whom beneficial title is vested.

Clean room - An uncontaminated area or room that is a part of the personal decontamination enclosure with provisions for storage of persons' street clothes and protective equipment.

Cleanup - The utilization of HEPA vacuuming and/or wet cleaning to control and eliminate accumulations of asbestos material and asbestos waste material.

Clearance air monitoring - The employment of aggressive sampling techniques with a volume of air collected to determine the airborne concentration of residual fibers upon conclusion of an asbestos abatement project.

Commissioner - Commissioner of the New York State Department of Labor.

Contractor - A Company, non-incorporated association, firm, partnership or corporation and any owner or operator thereof, which engages in an asbestos project or employs persons engaged in an asbestos project.

Curtained doorway - A device that consists of at least three overlapping sheets of plastic over an existing or temporarily framed doorway. One sheet shall be secured at the top and left side, the second sheet at the top and right side, and the third sheet at the top and left side. All sheets shall have weights attached to the bottom to ensure that the sheets hang straight and maintain a seal over the doorway when not in use.

Decontamination enclosure system - A series of connected rooms, separated from the work area and from each other by air locks, for the decontamination of persons, materials, equipment, and authorized visitors.

Encapsulant (sealant) or encapsulating agent - A liquid material which can be applied to asbestos material and which prevents the release of asbestos fibers from the material either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).

Enclosure - The construction of airtight walls, ceilings and floors between the asbestos material and the facility environment, or around surfaces coated with asbestos materials, or any other appropriate procedure as determined by the department that prevents the release of asbestos materials.

Environmental Consultant - Consultant hired by the Building Owner to provide abatement specifications.

Equipment room - A contaminated area or room that is part of the personal decontamination enclosure system with provisions for the storage of contaminated clothing and equipment.

Fixed object - A unit of equipment, furniture or other fixture in the work area which cannot be readily removed from the work area.

Flooring/Floor covering materials – all materials covering the slab or a floor of the building (i.e. mastics, glue, felts, flash patch, floor tiles, linoleum, etc.)

Friable Asbestos Material - Any ACM that can be crumbled, pulverized, or reduced to powder when dry, by hand or other mechanical pressure.

Friable material containment - The encapsulation or enclosure of any friable asbestos-containing material.

Glovebag technique - A method for removing asbestos material from heating, ventilating, and air conditioning (HVAC) ducts, piping runs, valves joints, elbows, and other non-planar surfaces in a non-contained work area. The glovebag assembly is a manufactured device consisting of a glovebag constructed of at least six mil transparent plastic, two inward-projecting long-sleeved gloves, which may contain an inward-projecting waterwand sleeve, an internal tool pouch, and an attached, labeled receptacle or portion for asbestos waste. The glovebag is constructed and installed in such a manner that it surrounds the object or area to be decontaminated and to contain all asbestos fibers released during the abatement process.

HEPA filter - A high efficiency particulate air filter capable of trapping and retaining 99.97 percent of asbestos fibers greater than 0.3 microns equivalent aerodynamic diameter.

HEPA vacuum equipment - Vacuuming equipment with a high-efficiency particulate air filtration system.

Holding area - A chamber in the waste decontamination enclosure located between the washroom and an adjacent uncontaminated area.

Homogeneous work area - A site within the abatement work area that contains one type of asbestos material and where one type of abatement is used.

Large asbestos project - An asbestos project involving the installation, removal,

disturbance, enclosure, or encapsulation of 160 square feet or more of asbestos or asbestos material or 260 linear feet or more of asbestos or asbestos material.

Minor asbestos project - An asbestos project involving the installation, removal, disturbance, enclosure, or encapsulation of 10 square feet or less of asbestos or asbestos material, or 25 linear feet or less of asbestos or asbestos - material.

Movable object - A unit of equipment, furniture or fixture in the work area that can be readily removed from the work area.

Negative air pressure equipment - A local exhaust system equipped with HEPA filtration. The system shall be capable of creating and maintaining a negative pressure differential between the outside and the inside of the work area.

Non-asbestos material - Any material containing one percent or less by weight

Occupied area - Any frequented portion of the work site where abatement is not taking place.

Outside air - The air outside the building or structure.

Personal air monitoring - A method used to determine an individual's exposure to airborne fibers. The sample is collected outside the respirator in person's breathing zone.

Plasticize - To cover floors, walls, ceilings and other surfaces with plastic sheeting as herein specified.

Project - Any form of work performed in connection with the abatement of asbestos or alteration, renovation, modification or demolition of a building or structure that may disturb asbestos or asbestos material.

Project Designer – A person who holds a valid Project Designer Certificate issued by the New York State Department of Labor.

Project Monitor – A person who holds a valid Project Monitor Certificate issued by the New York State Department of Labor.

Removal - The stripping of any asbestos material.

Repair - Corrective action using required work practices to control fiber release from damaged areas.

Respiratory protection - Respiratory protection required of authorized visitors in accordance with the applicable laws.

Registered Design Professional – A person licensed and registered to practice the professions of architecture or engineering under the Education Law of the State of New York.

Third Party Air Monitoring Firm - Monitoring Firm hired by the Building Owner to provide project and air monitoring and analytical laboratory services.

Satisfactory clearance air monitoring results - For all post-abatement samples, airborne

concentrations of asbestos fibers that are less than 0.01 fibers per cubic centimeter or background levels as indicated by this document.

Shower room - A room between the clean room and the equipment room in the personal decontamination enclosure with hot and cold running water controllable at the tap and arranged for complete showering during decontamination.

Small asbestos project - An asbestos project involving the installation, removal, disturbance, enclosure, or encapsulation of more than 10 and less than 160 square feet of asbestos or asbestos material of more than 25 and less than 260 linear feet of asbestos of asbestos material.

Staging area - The area near the waste transfer airlock where containerized asbestos waste has been placed prior to removal from the work area.

Surfactant - A chemical wetting agent added to water to improve its penetration.

Visible emissions - Any emissions of particulate material that can be seen without the aid of instruments.

Washroom - A room between the work area and the holding area in the waste decontamination enclosure system, where equipment and waste containers are wet cleaned and/or HEPA vacuumed.

Waste decontamination enclosure system - An area, consisting of a washroom and a holding area, designated for the controlled transfer of materials and equipment.

Wet cleaning - The process of eliminating asbestos contamination from surfaces, equipment or other objects by using cloths, mops, or other cleaning tools that have been dampened with amended water.

Work area - Shall mean designated rooms, spaces, or areas of the building or structure where asbestos abatement activities take place. For glovebag procedures, the work area shall also include the areas contiguous to where the procedure takes place.

Work Place Safety Plan – Documents prepared by a registered design professional and submitted for review by DEP in order to obtain an asbestos abatement permit. Such plan shall include, but not limited to, plans, sections, and details of the work area clearly showing the extent, sequence, and means and methods by which the work is to be performed.

Work site - Premises where asbestos abatement is taking place.

Work Surface - Substrate surface from which asbestos-containing material has been removed.

PART 5 - SPECIAL ON-SITE PROVISIONS

- 5.1** The Abatement Contractor shall provide, within 48-hours of award and at his own expense, all electrical, water, and waste connections, tie-ins, extensions, and construction materials, supplies, etc.

- 5.2** All connections must be approved in advance by the Building Owner and all work relative to the utilities must be in accordance with the applicable building codes.

5.3 SCAFFOLDING:

- A. If required or necessary, the Abatement Contractor shall provide scaffolding, ladders and staging, etc. as necessary to accomplish the work of this contract. Scaffolding may be of suspension type or standing type such as metal or cantilever type. The type, erection and use of all scaffolding shall comply with all applicable OSHA provisions including height to width ratios.

5.4 FACILITIES:

- A. All connections to the Building Owner's water system shall include reduced pressure backflow protection or double check and double gate valves.
- B. Valves shall be temperature and pressure rated for operation of the temperatures and pressures encountered. After completion of use, connections and fittings shall be removed without damage or alteration to existing water piping and equipment. Leaking or dripping valves shall be piped to the nearest drain or located over an existing sink or grade where water will not damage existing finish or equipment.
- C. The Abatement Contractor shall use only heavy-duty abrasion resistant hoses with a pressure rating greater than the maximum pressure of the water distribution system to provide water into each work area and to each decontamination unit. All water must be shut off at the end of each work shift.

5.5 ELECTRICAL SUPPLY:

- A. The Abatement Contractor shall provide service to decontamination unit electrical sub-panel with minimum 60 amp, 2 pole circuit breaker or fused disconnect and ground-fault circuit interrupters (GFCI), reset button and pilot light, connected to the buildings main distribution panel.
- B. All electrically driven devices, motors and equipment shall be powered by this or a comparable GFCI circuit. It will be the Abatement Contractor's responsibility to ensure that this and all applicable electrical usage are in compliance with all Department of Buildings, UL, and NFPA guidelines.
- C. Sub-panel and disconnect shall be sized and equipped to accommodate all electrical equipment required for completion of the work. This electrical sub-panel shall be used for hot water heater, PAPR battery recharging, etc.
- D. The Abatement Contractor shall provide a UL rated 40-gallon electric hot water heater to supply hot water for the decontamination unit shower. Activate from 30-amp circuit breaker located within the decontamination unit electrical sub-panel. Provide with relief valve compatible with water heater operation; relief valve down to drip pan on floor with type L copper. Wiring of the hot water heater shall be in compliance with NEMA, NEC,

and UL standards.

- E. The Abatement Contractor shall provide identification/warning signs at power outlets that are other than 110-120 volt power. Provide polarized outlets for plug-in type outlets, to prevent insertion of 110-120 plugs into higher voltage outlets. Dry transformers shall be provided where required to provide voltages necessary for work operations.
- F. Ground fault circuit interrupters (GFCI) at the power source must protect outlets or power supplies.
- G. The Abatement Contractor shall use only grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Use single lengths or use waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas of work.
- H. The Abatement Contractor shall provide general service incandescent lamps of wattage indicated or required for adequate illumination. Protect lamps with guard cages or tempered glass enclosures, where fixtures are exposed to breakage by construction operations. Provide exterior fixtures where fixtures are exposed to the weather or moisture.

5.6 WORKING CONDITIONS:

- A. The Abatement Contractor shall be responsible for maintaining acceptable working temperatures inside and immediately outside the work areas. The equipment shall have been tested and labeled by UL, FM or another recognized trade association related to the fuel being used. The Abatement Contractor shall also provide a comfortable working environment for occupied areas that are impacted by the asbestos removal.
- B. The Abatement Contractor shall comply with recommendations of the NFPA 10 standard in regard to the use and application of fire extinguishers. Locate fire extinguishers where they are most convenient and effective for their intended purpose, but provide not less than one extinguisher in each work area, equipment room, clean room and outside the work area.

PART 6 - ASBESTOS ABATEMENT PROCEDURES

6.1 PERSONNEL DECONTAMINATION ENCLOSURE SYSTEM

- A. The personal decontamination enclosure shall be constructed prior to preparation of the work area (s). The personal decontamination enclosure system shall consist of a clean room, a shower room, and an equipment room, in series, separated from each other and from the work area by three airlocks.
- B. There shall be one (1) shower per six (6) full shift abatement persons calculated on the basis of the largest shift.
- C. The personal decontamination enclosure system shall be fully framed and covered with 3/8-inch thick (minimum) fire-retardant hard sheathing and shall be capable of withstanding extreme weather conditions.

- D. Personal decontamination enclosure systems constructed at the work site shall utilize at least six-mil fire retardant plastic sheeting. The enclosure shall be fully lined with at least two (2) layers of opaque six-mil fire retardant plastic sheeting shall be used for the flooring of this area. The floor of the enclosure shall be lined with at least two (2) layers of reinforced 6-mil plastic sheeting.
- E. All prefabricated or trailer decontamination units shall be completely decontaminated and sealed prior to separation and removal from the work area.
- F. The clean room shall be sized to accommodate all authorized persons. Benches, lockers and hooks shall be provided for street clothes. Shelves for storing respirators shall also be provided. Clean clothing, replacement filters for respirators, towels and other necessary items shall be provided.
- G. The clean room shall not be used for the storage of tools, equipment or materials. It shall not be used for office space. A lockable door shall be provided to permit access to the clean room from outside the work area or enclosure and shall be kept locked during off-shift hours.
- H. The shower room shall contain one or more showers. Each showerhead shall be supplied with hot and cold water adjustable at the tap. The shower enclosure shall be constructed to ensure against leakage of any kind. Uncontaminated soap, shampoo and towels shall be available at all times. Shower water shall be drained, collected and filtered through a system with at least 5.0-micron particle size collection efficiency.
- I. A system containing a series of several filters with progressively smaller pore sizes shall be used to avoid rapid clogging of the filtration system by large particles. Filtered wastewater shall be discharged in accordance with applicable codes and used filters disposed of as asbestos waste.
- J. The equipment room shall be used for the storage of equipment and tools after decontamination using a HEPA filtered vacuum and/or wet cleaning. A one-day supply of replacement filters, in sealed containers, for HEPA vacuums and negative pressure ventilation equipment, extra tools, containers of surfactant and other materials and equipment that may be required during the abatement Project may also be stored here.
- K. A walk-off pan filled with water and surfactant shall be located in the work area just outside the equipment room for persons to clean foot coverings when leaving the work area. A drum lined with a six-mil double plastic bag is required for collection of clothing shall be labeled and located in this room. Contaminated footwear and work clothes shall be stored in this area.

6.2 WASTE DECONTAMINATION ENCLOSURE

A. General Requirements:

A waste decontamination enclosure system shall consist of the following:

A washroom/cleanup room shall be constructed with an airlock doorway to the work area and another airlock doorway to the holding area.

The holding area shall be constructed with an airlock doorway to the washroom/cleanup room and another lockable door to the outside.

- B. The waste decontamination enclosure system shall be fully framed and covered with 3/8-inch thick (minimum) hard sheathing and shall be capable of withstanding extreme weather conditions.
- C. The waste washroom shall be equipped with a drain installed to collect water and deliver it to the shower drain where it shall be filtered as described under Section 1.9, Personnel Decontamination. Waste shall be transferred only during times when the showers are not in use.

6.3 DECONTAMINATION PROCEDURES

- A. The following procedures shall be followed throughout the asbestos abatement project until satisfactory clearance air monitoring results have been achieved:
 - 1. All persons shall enter and exit the work area through the personal decontamination enclosure system.
 - 2. All persons who enter the work area or an enclosure shall sign the entry/exit log, located in the clean room, upon every entry and exit.
 - 3. All persons, before entering the work area, or an enclosure shall read and be familiar with all posted regulations, personal protection requirements, including work area entry and exit procedures, and emergency procedures. The entry/exit log headings shall indicate, and the signatures shall be used to acknowledge, that these have been reviewed and understood by all persons prior to entry.
 - 4. All persons shall proceed first to the clean room, remove all street clothing, store these items in clean areas/lockers and don coveralls, head covering, foot covering and gloves. All authorized visitors shall also don NIOSH approved respiratory protection. Authorized visitors entering the work area must wear clean respirators and protective clothing. Respirators shall be inspected prior to each use and tested for proper seal using quantitative or qualitative fit checks.
 - 5. Persons wearing designated personal protective equipment shall proceed from the clean room through the shower room to the equipment room, where the necessary tools are collected and any additional clothing shall be donned, before entry into the work area.
 - 6. Before leaving the work area, all persons shall remove gross contamination from the outside of respirators and protective clothing by brushing, wet cleaning, and/or HEPA vacuuming.
 - 7. Persons shall proceed to the equipment room where all coveralls, head covering, foot covering and gloves shall be removed. Disposable clothing shall be deposited into labeled containers for disposal. Reusable contaminated clothing, footwear, head gear and gloves shall be stored in the equipment room when not being used in the work area.
 - 8. Still wearing respirators, persons shall proceed to the shower area, clean the outside of the respirator and the exposed face area under running water prior to removal of the respirator, and then fully and vigorously shower and shampoo to remove

residual asbestos contamination. Respirators shall be washed thoroughly with soap and water. Some types of respirators will require slight modification of these procedures. An airline respirator with

9. HEPA filtered disconnect protection shall be disconnected in the equipment room and worn into the shower. A powered air-purifying respirator face piece shall be disconnected from the filter/power pack assembly prior to entering the shower.
10. After showering and drying, all persons shall proceed to the clean room and don clean personal protective equipment if returning to the work area or street clothing if exiting the enclosure.

B. The following procedures shall be followed throughout the asbestos abatement project until satisfactory clearance air monitoring results have been achieved:

1. External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the work area before moving such items into the waste decontamination enclosure system airlock by persons assigned to this duty. These work area persons shall not enter the airlock. These contaminated items shall be removed from the airlock by persons stationed in the washroom during waste removal operations.
2. These washroom persons shall remove gross contamination from the exterior of their respirators and protective clothing by brushing, HEPA vacuuming and/or wet cleaning.
3. Once in the waste decontamination enclosure system, external surfaces of contaminated containers and equipment will be cleaned a second time by wet cleaning.
4. The cleaned containers of asbestos material and equipment are to be dried of any excessive pooled or beaded liquid, placed in uncontaminated plastic bags or sheeting and sealed airtight.
5. The clean re-containerized items shall be moved into the airlock that leads to the holding area. The washroom persons shall not enter this airlock or the work area until waste removal is finished for that period.
6. Containers and equipment shall be moved from the airlock and into the holding area by persons dressed in clean personal protective equipment, who have entered from uncontaminated areas.
7. The cleaned containers of asbestos material and equipment shall be placed in watertight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.
8. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.
9. Where the waste removal enclosure is part of the personal decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short-circuiting and cycling or air

outward through the shower and clean room.

PART 7 – MATERIALS AND EQUIPMENT

- 7.1 Materials shall be stored off the ground, away from wet or damp surfaces and under protective cover to prevent damage or contamination. Supplies and materials shall be stored outside the work area during abatement.
- 7.2 Damaged/deteriorating materials shall not be used and must be removed from the premises.
- 7.3 Fire Retardant plastic sheeting of at least six-mil thickness in sizes and shapes to minimize the number of joints shall be employed for containment. Duct tape shall be capable of sealing joints of adjacent sheets of plastic, facilitating attachment of plastic sheets to finished or unfinished surfaces of dissimilar materials and adhering under both dry and wet conditions.
- 7.4 Any surfactant used shall be non-carcinogenic and not generally toxic in normal use. Aquagro by Aquatrols Corporation or Asbestite 1000 by Arpin Products or approved equal shall be used.
- 7.5 Water-tight fiber containers shall be provided to receive and retain any asbestos containing or contaminated material for storage until disposal. These fiber containers are to be utilized in the waste packaging of all abated materials, which are inappropriate for disposal in asbestos waste bags, i.e. sharp or edged wastes, excessively heavy debris, etc.
- 7.6 Plastic bags used for waste storage or disposal shall be at least six-mil in thickness.
- 7.7 All containers used for storage or disposal shall be marked with asbestos caution labels in large, bold letters on a contrasting background in confirmation with OSHA and US DOT regulations.
- 7.8 The labels shall contain the following information:

**DANGER
CONTAINS ASBESTOS FIBERS
AVOID BREATHING DUST
CANCER AND LUNG DISEASE HAZARD
RQ HAZARDOUS SUBSTANCE
SOLID, NOS, ORM-E, NA9188
(ASBESTOS)**

- 7.9 The Abatement Contractor shall make available to authorized visitors, ladders and/or scaffolds of sufficient dimension and quantity so that all work surfaces can be easily and safely reached. Scaffold joints and ends shall be sealed with tape to prevent incursion of asbestos. Scaffolds and ladders shall comply with all applicable codes.
- 7.10 The following procedures shall be followed while conducting lockdown encapsulation after removal of asbestos-containing materials to seal in non-visible residue:

- 7.11 Only encapsulants rated as acceptable or marginally acceptable on the basis of Battelle Columbus Laboratory test procedures and rating requirements developed under the 1978 USEPA contract shall be used for lockdown encapsulation. Latex paint with solids content greater than 15% shall be considered a lockdown sealant for coating all non-metallic surfaces. Acceptable materials are Chil-Abate CP-210, Childer Products Company; Serpiflex Shield, International Protective Coatings Corp.; or approved alternate.
- 7.12 Sealants considered for use in encapsulation shall first be tested to ensure that the sealant is adequate for its intended use. A section of the work surface shall be evaluated following this initial test application of the sealant to quantitatively determine the sealant effectiveness in terms of penetrating and locking down the asbestos fibers.
- 7.13 The American Society of Testing and Materials (ASTM) Committee E06.21.06E on Encapsulation of Building Materials has developed a guidance document to assist in the selection of an encapsulant.
- 7.14 Encapsulants shall be applied using airless spray equipment. Spraying is to occur at the lowest pressure range possible to minimize fiber release from encapsulant impact at the surface. It shall be applied with a consistent horizontal or vertical motion.
- 7.15 Encapsulation shall be utilized after first cleaning and prior to first sheeting removal - once the work area(s) has been rendered free of visible residues. It shall be employed as a surface sealant to any surfaces in the work area, which were not subject of removal or other remediation. It shall not be applied to any surfaces in the work area that was the subject of removal or other remediation activities prior to obtaining satisfactory clearance air monitoring results.

PART 8 – PROJECT AIR MONITORING

- 8.1 The Third Party Air Monitoring Firm will designate a Project Monitor (PM) during the abatement work. The PM must be on the job site at all times during abatement work. Absolutely no abatement or preparation work will occur without the presence of the PM.
- 8.2 The PM will likely conduct five (5) milestone inspections:
 - A. Pre-commencement inspection shall be conducted as follows:
 - B. Notification in writing to the Consultant shall be made by the Abatement Contractor to request a pre-commencement inspection at least 48 hours in advance of the desired date of inspection. This inspection shall be requested each time another work site is started.
 - C. The PM shall ensure that:
 - D. The job site is properly prepared and that all containment measures are in place.
 - E. All workers shall present to the inspector a valid work permit issued by the New York State Department of Labor and New York City Department of Environmental Protection (as applicable).
 - F. Measures for the disposal of removed asbestos material are in place and shall

- conform to the adopted standards;
- G. The Abatement Contractor has a list of emergency telephone numbers at the job site which shall include the Environmental Consultant and Third Party Air Monitoring Firm employed by the Building Owner and telephone numbers for fire, police, emergency squad, local hospital and health officer.
 - H. If all is in order, the PM shall issue a written notice to proceed in the field. If the job site is not in order, then any needed corrective action must be taken before any work is to commence. Conditional approvals shall not be granted.
 - I. Progress inspection shall be conducted as follows:
 - J. Primary responsibility for ensuring that the abatement work progresses in accordance with these technical abatement document(s) rests with the PM. The PM shall continuously be present to observe the progress of work and perform required tests.
 - K. If the PM observes irregularities at any time, he shall direct such corrective action as may be necessary. If the Abatement Contractor fails to take the corrective action required, or if the Abatement Contractor or any of their employees habitually and/or excessively violate the requirements of any regulation, then the PM shall inform the Building Owner and General Contractor who shall issue a Stop Work Order to the Abatement Contractor and have the work site secured until all violations are abated.

8.3 Pre-sealant inspection:

- A. The pre-sealant inspection will be conducted by the PM before the sealant is applied. It is the Abatement Contractor's responsibility to request the pre-sealant inspection in writing 48 hours in advance. If the pre-sealant inspection is acceptable, the PM will indicate the approval in writing.
- B. The pre-sealant inspection will be conducted only in work areas where ACM's have been removed from substrates that are to be encapsulated.

8.4 Clean-up inspections shall be conducted as follows:

- A. Notice for clean-up inspection shall be requested by the Abatement Contractor at least 48 hours in advance of the desired date of inspection;
- B. The clean-up inspection shall be conducted prior to the removal of any isolation or critical barriers and before final air clearance monitoring;

8.5 The PM shall ensure that:

- A. The work site has been properly cleaned and is free of visible asbestos and asbestos-containing material and is consistent with pre-agreed "bench mark" area.
- B. All removed asbestos has been properly placed in a locked secure container outside of the work area.

8.6 If all is in order, the PM shall issue a written notice of authorization to remove surface barriers from the work area.

8.7 Final inspection shall be conducted as follows:

- A. Upon notice by the Building Owner or by the Abatement Contractor and at least 48 hours after the removal of the critical barriers, a final inspection shall be made to ensure the absence of any visible signs of asbestos or asbestos-containing materials.
- B. The PM shall ensure that all asbestos waste and asbestos-contaminated waste has been removed from the work site in a registered vehicle by a registered waste hauler.
- C. Sampling pumps shall have a minimum flow rate capacity of two (2) liters per minute and shall be pre-calibrated and post-calibrated each time they are used. The calibrations shall be recorded. All air samples shall be accompanied by a chain-of-custody record.
- D. Upon receipt of final air samples at the conclusion of each asbestos abatement project location, the Project Monitor is required to sign off that the work has been successfully completed.

8.8 ASBESTOS PROJECT AIR SAMPLING & ANALYSIS REQUIREMENTS

- A. Air sampling and analysis shall be conducted by the Third Party Air Monitoring Firm in accordance with the methods of abatement as prescribed by the Abatement Contractors methods of abatement and filing application/variance requests, but is to include following as a minimum:
- B. Pre-Abatement; During-Abatement and Post-Abatement area sampling for a Large Asbestos Project shall be performed as detailed by the method of abatement and/or all variance requests.
Phase Contrast Microscopy (PCM) analysis is a minimally acceptable method of analysis. PCM will be utilized during the removal phase of the project. Transmission Electron Microscopy (TEM) analysis shall be performed in accordance with 40 CFR Part 763, Subpart E, Appendix A – Section IV –
- C. Mandatory Interpretation of Transmission Electron Microscopy Results to Determine Completion of Response Actions, and will be utilized for background and final clearance data.
- D. Whichever methodology is selected must be used consistently for pre-abatement, abatement, and post-abatement monitoring.

8.9 PRE-ABATEMENT AIR SAMPLING:

- A. For pre-abatement monitoring, a minimum of five area samples shall be taken from within and at the barriers of each homogeneous work area.
- B. In addition to the five sample minimum requirement set forth above, one representative area sample for every 5,000 square feet above 25,000 square feet of floor space, shall be taken.

8.10 DURING ABATEMENT AIR SAMPLING:

- A. Once abatement activities have begun, the following schedule of samples shall be required, as a minimum, on a daily basis:
- B. Two area samples shall be taken outside the work area and the enclosures, but within the building or structure, in uncontaminated areas that are within ten feet of the isolation barriers. Where negative ventilation exhaust ducts run through uncontaminated areas, one of the area samples shall be taken in one of these areas. Where adjacent non-work areas do not exist, an additional exterior area sample, remote from that in item (b) below, shall be taken.
- C. Primary location selection shall be within 10 feet of isolation barriers. Where negative ventilation exhaust ducting runs through uncontaminated building areas, one of the area samples will be required in these areas to monitor any potential fiber release.
- D. One area sample shall be taken outside the work area, in uncontaminated areas that are within ten feet of and within the actual environment of the entrance/exit of each personnel decontamination and waste decontamination enclosure.
- E. One area sample shall be taken outside the building or structure.
One area sample shall be taken within five feet of each unobstructed, negative pressure ventilation equipment exhaust.
- F. Note: The size of the abatement project will determine the number of samples necessary.

8.11 POST ABATEMENT AIR SAMPLING:

- A. For post-abatement monitoring, a minimum of five area samples for each homogeneous work area shall be taken from within the work area, or as prescribed by the methods, filing and variance request(s) obtained to perform this work.
- B. Sampling shall not commence until at least four hours after the third wet cleaning has been completed and (2) no visible pools of liquid or condensation remain, as applicable.
- C. Air samplers shall be placed at random around the work area. If the work area contains the number of rooms equivalent to the number of required samples based on floor area, place a sampler in each room. When the number of room is greater than the required number of samples, a representative sample of room shall be selected.
- D. The following aggressive sampling techniques shall be used for all clearance air monitoring:
- E. Before starting the sampling pumps, the exhaust of forced air equipment shall be directed against all walls, ceilings, floors, ledges and other surfaces in the rooms. This shall continue for at least five minutes per 1000 square feet of floor.
At least a 20-inch fan shall be placed in the center of each room. One fan per 10,000 cubic feet of room space shall be used. The fan shall be operated on slow speed and pointed toward the ceiling.
- F. The sampling pumps shall then be turned on. A minimum volume of eighteen hundred

(1,250) liters of air shall be sampled.

- G. When sampling has been completed, the sampling pumps shall be turned off first, followed by the fan.
- H. During clearance air monitoring, the negative air filtration equipment shall be reduced to two air changes per hour.
- I. For clearance air monitoring, the samplers, placed outside the work area but within the building or structure, shall be so located as to avoid any air that might escape through the isolation barriers.
- J. Note: Minimum distances should be at least fifty feet from the entrance to the work area and twenty-five feet from the plastic barrier.

8.12 ANALYSIS AND RESULTS:

- A. The methodology chosen for sampling and analysis and the microscope type, make and model number shall be included in the results.
- B. Laboratory analyses of air samples shall be considered evidence of compliance with these specifications only if they conform to the following requirements:
 - 1. Analytical results for air samples collected and analyzed via PCM shall be posted on site within 24 hours of collection.
 - 2. Preparation and analysis of area samples by PCM shall be by NIOSH method 7400, using B Rules.
 - 3. Preparation and analysis of samples by TEM shall be by the EPA Provisional
 - 4. Methodology for the Measurement of Airborne Asbestos by Electron Microscopy.
 - 5. PCM analysis results shall be reported as a fiber concentration (f/cc) for each sample.
- C. TEM analysis results shall be reported as follows:
 - 1. The level of analysis of each sample.
 - 2. The fiber count in each category: chrysotile, amphibole group, ambiguous, non-asbestos and no identification.
 - 3. Total Chrysotile and amphibole group fiber concentration (f/cc) and mass concentration (µg/cc or appropriate units) for each sample.
 - 4. Fiber concentration (f/cc) for all fibers of 0.25 microns to 3 microns diameter and 5.0 microns length or greater with an aspect ratio 5 to 1 or greater for each sample. This fraction may be used for comparison with PCM results.

5. Fiber concentration (f/cc) of chrysotile and amphibole group fibers of 0.25 microns to 3.0 microns diameter and 5.0 microns length or greater with an aspect ratio of 5 to 1 or greater for each sample (Assume the density of chrysotile is 2.6 g/cm^3 and the density of amphiboles is 3.0 g/cm^3).
- D. Work shall stop for inspection, and the integrity of barriers shall be restored if air samples collected outside of the work area during abatement activities indicate airborne fiber concentrations greater than original background levels or greater than the 0.01 f/cc as determined by phase contrast microscopy, whichever is larger. Clean-up of surfaces outside of the work area using HEPA vacuums or wet cleaning techniques shall be done prior to resuming abatement activities.
- E. When visible emissions outside the work area or any area air sample indicates a determinant level of fiber concentrations greater than the larger of baseline levels, or equal or greater than 0.01 f/cc, work shall stop for inspection, to remedy the levels.
- F. For mass removal, the integrity of containment barriers, if disturbed, shall be restored. Clean-up of surfaces outside of the work area using HEPA vacuums or wet cleaning techniques shall be done prior to resuming activities. Additional air sampling shall be conducted outside the isolation barriers to determine the extent of contamination.

8.13 CLEARANCE CRITERIA:

- A. The clearance criteria shall be applied to each homogenous work area independently.
- B. For PCM analysis the clearance air monitoring shall be considered satisfactory when every sample is less than or equal to 0.01 f/cc or less than the ambient concentration, whichever is larger.
- C. For TEM analysis, the clearance monitoring will be considered satisfactory when the average of the measured work area levels is statistically no larger than the average of the outdoor measured levels. TEM release criteria shall involve coefficient of variation evaluation as specified in "Measuring Airborne Asbestos Following an Abatement Action", USEPA document 600/4-85-049 (November 1985).
- D. Personnel Air (OSHA) monitoring shall be performed by the Abatement Contractor during each full shift during which abatement activities occur and in each containment area in order to accurately determine the concentrations of airborne asbestos to which workers may be exposed.
- E. A qualified air sampling professional shall conduct personnel air monitoring in accordance with the NIOSH Standard Method 7400 and CFR 1926.58 (OSHA), Appendix A.
- F. Results of personnel air sample analyses shall be posted on site within 24 hours of collection.
- G. The Abatement Contractor shall provide:
 1. sufficient electrical hook up for all equipment to be used by the Consultant

2. sufficient linear footage of electrical wiring to reach each and every corner of the abatement area
3. one stand by of each type of equipment to be utilized for the project

PART 9 - RESPIRATORY PROTECTION

- 9.1** Respiratory protection shall be worn by all individuals inside the work area from the initiation of the asbestos project until all areas have successfully passed clearance air monitoring in accordance with these specifications. The Abatement Contractor shall keep available at all times two PAPR's with new filters and charged batteries for use by authorized visitors.
- 9.2** All respiratory protection shall be MSHA/NIOSH approved in accordance with the provisions of 30 CFR Part II. All respiratory protection shall be provided by the Abatement Contractor, and used by workers in conjunction with the written respiratory protection program.
- 9.3** The Abatement Contractor shall provide respirators selected by an Industrial Hygienist that meets the following requirements:
- A. Full face-piece Type C supplied-air respirators operated in pressure demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus shall be worn during gross removal, demolition renovation and/or other disturbance of ACM whenever airborne fiber concentrations inside the work area are equal to or greater than 10.0 f/cc.
 - B. Full face-piece Type C supplied-air respirators operated in pressure demand mode with HEPA filter disconnect protection shall be worn during gross removal, demolition, renovation and/or whenever airborne fiber concentrations inside the work area are equal to or greater than 2.0 f/cc and less than 10.0 f/cc.
 - C. Full face-piece powered air-purifying respirators (PAPR) equipped with HEPA filters shall be worn during the removal, encapsulation, enclosure, repair and/or other disturbance of friable ACM whenever airborne fiber concentrations inside the work area are less than 0.5 f/cc.
 - D. A supply of charged replacement batteries, HEPA filters and flow test meter shall be available in the clean room for use with powered air-purifying respirators. HEPA filters shall be changed daily or as flow testing indicates change is necessary. Any Type C supplied-air respirator operated in continuous flow may be substituted for a PAPR.
 - E. Half-mask or full face air-purifying respirators with HEPA filters shall be worn only during the preparation of the work area, non-friable abatement activities, performance of repairs (e.g. using glovebag techniques) and final clean up procedures provided airborne fiber concentrations inside the work area are less than 0.1 f/cc. Use of single use dust respirators is prohibited for the above respiratory protection.
 - F. Where not in violation of NIOSH and OSHA requirements and where more stringent than the requirements of C above, the Abatement Contractor shall provide the following minimum respiratory protection to the maximum use concentrations indicated:

MSHA/NIOSH Approved	Maximum Use
Respirator Protection	Concentrations
Half Mask Air-Purifying With HEPA Filters	0.1 f/cc
Full Face-piece Air Purifying, HEPA Filters and Quantitative Fit Test	0.5 f/cc
Powered Air Purifying (PAPR), Loose fitting Helmet or Hood, HEPA Filter	0.25 f/cc
Powered Air Purifying (PAPR), Full Face-piece, HEPA Filter.	0.5 f/cc
Supplied Air, Continuous Flow Loose fitting Helmet or Hood	0.25 f/cc
Supplied Air, Continuous Flow, Full Face-piece, HEPA Filter	0.5 f/cc
Full Face-piece Supplied-Air, Pressure Demand, HEPA Filter	10 f/cc
Full Face-piece Supplied-Air, Pressure Demand, w/Aux. SCBA, Pressure Demand or Cont. Flow	>10 f/cc

Workers shall be provided with personally issued and individually marked respirators. Respirators shall not be marked with any equipment that will alter the fit of the respirator in any way. Only waterproof identification markers shall be used.

- G. The Abatement Contractor shall ensure that the workers are qualitatively or quantitatively fit tested by an Industrial Hygienist initially and every six months thereafter with the type of respirator he/she will be using.
- H. Whenever the respirator design permits, workers shall perform the positive and negative air pressure fit test each time a respirator is worn. Powered air-purifying respirators shall be tested for adequate flow as specified by the manufacturer.
- I. No facial hairs (beards) shall be worn when wearing respiratory protection that requires a mask-to-face seal.
- J. Contact lenses shall not be worn in conjunction with respiratory protection on asbestos projects. If a worker wears glasses, a spectacle kit to fit their respirator shall be provided by the Abatement Contractor at the Contractor's expense.
- K. Respiratory Protection maintenance and decontamination procedures shall meet the following requirement:

- 1. Respiratory protection shall be inspected and decontaminated on a daily basis in

accordance with OSHA 29 CFR 1910.134(b);

2. HEPA filters for negative pressure respirators shall be changed after each shower;
3. Respiratory protection shall be the last piece of worker protection equipment to be removed. Workers must wear respirators in the shower when going through decontamination procedures;
4. Airline respirators with HEPA filtered disconnect shall be disconnected in the equipment room and worn into the shower. Powered air-purifying respirator face-pieces shall be worn into the shower. Filtered/power pack assemblies shall be decontaminated in accordance with manufacturer's recommendations;
5. Respirators shall be stored in a dry place and in such a manner that the face-piece and exhalation valves are not distorted and;
6. Organic solvents shall not be used for washing of respirators.
7. No visitors shall be allowed to enter the contaminated area if they do not have their medical certification and their own respirator and training certificate. Authorized visitors shall be provided with suitable respirators and instructions on the proper use of respirators whenever entering the work area. Qualitative fit test shall be done to ensure proper fit of respirator.

PART 10 - WASTE DISPOSAL

10.1 GENERAL REQUIREMENTS:

All asbestos waste shall be stored, transported and disposed of as per, but not limited to, the following Regulations:

NYS DOS
NYS DOL
NYS DEC
EPA NESHAPS 40 CFR 61
USEPA ASBESTOS WASTE MANAGEMENT GUIDANCE
EPA/530-SW-85-007

10.2 TRANSPORTER AND DISPOSAL SITE:

- A. The Environmental Consultant shall approve the Abatement Contractor's Transporter (hauler) and disposal site.
- B. The Abatement Contractor shall give 24-hour notification prior to removing any waste from the site. Waste shall be removed from site only during normal working hours. No waste may be taken from the site without authorization from the Environmental Consultant.
- C. The Abatement Contractor shall have the transporting company give the date and time of arrival at the disposal site. Upon arrival at the removal site, the Transport company must possess and present to the Environmental Consultant a valid State Department of Environmental Conservation asbestos hauling permit. The Environmental Consultant may

verify the authenticity of the hauling permit.

- D. The waste transport company, with the Abatement Contractor and the Environmental Consultant, shall inspect all material in the transport container prior to taking possession and signing the Asbestos Waste Manifest.
- E. The Waste Transporter shall not have any off-site transfers of the waste or allow the waste to be combined or transported with any other off-site asbestos material. The Transporter must travel directly to the disposal site with no unauthorized stops.

10.3 WASTE STORAGE CONTAINER:

- A. All waste containers shall be fully enclosed and lockable (i.e. enclosed Dumpster, 40' Trailer, etc.).
- B. NO OPEN CONTAINERS WILL BE ALLOWED (i.e. open Dumpster with canvas cover, etc.).
- C. The containers shall be lined with six-mil polyethylene sheeting and sealed with a minimum of one (1) layer of six-mil polyethylene on the sides and two (2) layers of six-mil polyethylene sheeting on the floor. The container shall be labeled with EPA Danger signage:

**DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD**

- D. The NYS DEC waste transporter's permit number shall be on both sides and back of the container.
- E. The container will not be permitted to leave the site without the proper signage.
- F. Once the container(s) are loaded at the site, the door(s) will be locked and the door(s) locked. The seals shall be removed at the disposal site by the Owner or operator of the disposal facility and returned by the disposal facility directly to the Environmental Consultant with the completed waste manifest.
- G. The Owner may initiate random checks at the disposal site to insure that the procedures outlined herein are complied with.

10.4 WASTE DISPOSAL MANIFEST:

- A. The Asbestos Waste Manifest shall be provided to the Building Owner and is the only manifest to be utilized.
- B. The Waste Manifest shall be completed by the Abatement Contractor and verified by the Environmental Consultant that all the information is accurate and the proper signatures are in place. The Waste Manifest shall have the signatures of the Environmental Consultant, the Abatement Contractor and the Transporter prior to any waste being removed from the site. A copy of the completed Waste Manifest shall be retained by the

Environmental Consultant and remain on site for inspection.

- C. Upon arrival at the Disposal Facility, the Waste Manifest shall be signed by the Disposal Facility owner or operator to certify receipt of asbestos containing materials covered by the manifest. The Disposal Facility owner or operator shall return the Waste Manifest, dump ticket/invoice and the container seals to the Environmental Consultant.
- D. Copies of the completed Manifest are to be sent by Disposal Facility owner or operator to the Building Owner and the Abatement Contractor.

E. COMPLIANCE:

The Environmental Consultant shall decide as to the meaning and applicability of any part of the technical abatement document(s) and its decision shall be binding and final unless overruled by the Building Owner in writing prior to any deviation from the Environmental Consultant's instruction.

Failure to adhere to these procedures shall constitute a material breach of the Contract and the Building Owner shall have the right to and may terminate the Contract provided, however, the failure of the Building Owner to so terminate shall not relieve the Contractor from future compliance.

****End of Section****

Limited Asbestos Inspection Report

Performed at:

2610 Amawalk Road, Somers, New York



Prepared for:

Attn: Steven La Rocca, AIA LEED AP
La Rocca Greene Architects LLC
22 Purchase Street
Rye, New York 10580

Prepared by:

Environmental Maintenance Contractors, Inc.
5 Anderson Lane
Goldens Bridge, New York 10526
Tel: 914-232-7355, Fax: 914-232-7357
Email: rstumbo@enviromain.com

Date: June 3, 2016

ENVIRONMENTAL MAINTENANCE CONTRACTORS, INC.

Environmental Consulting, Testing, Reporting and Remedial / Abatement Services

*Asbestos Testing and Removal * Lead Based Paint (XRF) Testing * Underground Storage Tank Removal Services*
* Indoor Air Quality Testing * Mold Abatement Service * Hazardous Material Testing and Abatement *
Environmental Phase I and II Assessments

June 3, 2016

Attn: Steven La Rocca, AIA LEED AP
La Rocca Greene Architects LLC
22 Purchase Street
Rye, NY 10580

Phone: (914) 967-3494 Fax: (914) 967-3376
Email: slarocca@laroccagreene.com

LIMITED ASBESTOS SURVEY/INSPECTION REPORT

PROPERTY INSPECTED

Subject property is located at 2610 Amawalk Road, Somers NY.

TARGET STRUCTURE/AREAS

Limited survey of readily accessible suspect Asbestos Containing Materials (ACM's) within the interior and exterior of the Main House of Lasdon Park located at 2610 Amawalk Road, Somers NY.

GENERAL DESCRIPTION OF TARGETED STRUCTURES/AREAS

The target areas are the interior and exterior of the Main House of Lasdon Park located at 2610 Amawalk Road, Somers NY.

INSPECTION RATIONALE

Environmental Maintenance Contractors, Inc. (EMC) was retained to perform a non-destructive limited inspection of the target areas which contain accessible suspect Asbestos Containing Materials (ACM's). No penetrations or exploratory demolition was performed to collect samples during the asbestos survey including, but not necessarily limited to, walls and floor cavities.

INSPECTION AND BULK SAMPLE COLLECTION

The target areas were inspected for suspect ACM's on March 1, 2016 and May 26, 2016. All accessible areas/rooms were visually inspected and representative samples were collected, as appropriate and required by NYS. The inspection was performed by Francis Ciriaco and Floyd Sus representing EMC. Mr. Ciriaco (Cert. # 09-19591) and Mr. Sus (Cert. # 06-00928) are Certified NYS Department of Labor (DOL) Asbestos Inspectors.

INSPECTION PROTOCOL

The purpose of the inspection was to identify readily accessible asbestos containing building materials within the target areas. For the purpose of performing this inspection, EMC inspectors visited all accessible areas within the target areas and collected samples of representative materials.

INACCESSIBLE AREAS

N/A

LABORATORY

Friable (joint compound, plaster, sheetrock, etc.) and Non-Friable-Organically Bound (NOB) (base cove glue, linoleum, floor tiles, etc.) materials were both analyzed by Polarized Light Microscopy (PLM). Any NOB samples that were negative for asbestos via PLM were analyzed via Transmission Electron Microscopy (TEM) for confirmatory purposes, per NYS requirements. The NYS Department of Health (DOH) requires TEM analysis to conclusively state that a NOB sample does not contain asbestos.

SAMPLED MATERIALS

The following is a listing of the suspect asbestos containing building materials collected from the target areas and submitted for analysis for the purpose of this report:

1st Floor

- Joint Compound
- Sheetrock
- Plaster (Brown & White)
- Base Cove Glue (White & Beige)
- Base Cove Molding (White & Grey)
- Floor Tile Mastic
- 12" x 12" Floor Tile
- Ceiling Paper

2nd Floor

- Plaster (Brown & White)
- Wall Paper (Yellow Stripe, Blue Stripe, Floral Pattern, Tan)
- Stucco
- Base Board
- Base Board Glue
- Base Cove Glue
- Base Cove Molding
- Ceramic Wall Tile Grout
- Linoleum Mastic
- Linoleum Felt
- Linoleum (Maroon & Brown)
- Floor Felt/Glue
- 9 x 9 Floor Tile
- Floor Tile/Glue
- Vinyl Tile Glue/Mastic
- 12 x 12 Vinyl Tile
- 12 x 12 Floor Tile

3rd Floor

- Plaster (Brown & White)
- Joint Compound
- Sheetrock
- Base Cove Molding
- Base Cove Glue
- Wall Covering
- Linoleum Mastic
- Linoleum (Maroon, Red, Brown)
- Floor Felt
- Floor Tiles
- 9 x 9 Vinyl Tile Glue
- 9 x 9 Vinyl Tile
- Black Paper
- Stucco

Attic

- Attic Insulation

Flat Roof

- Flashing Tar
- Roof Felt Beneath Copper Metal
- Roof Board

Exterior

- Wall Shingle Felt
- Wall Shingle Tar
- Window Glazing

Basement

- Ceiling Plaster
- Ceiling Insulation
- Pipe Insulation
- Pipe Fitting Insulation

Main Roof - Slope Shingle Roof

- Roof Tar
- Roof Felt
- Roof Membrane
- Sloped Roof Felt
- Sloped Roof Shingles
- Tar on Parapet Wall
- Chimney Tar
- Roof Insulation
- Roof Board

RESULTS & QUANTITIES (Asbestos Containing Materials Only)

Sample analysis indicates that the following materials were found to contain asbestos in concentrations greater than one-percent (>1%) and are therefore deemed ACM's, including:

ACM Type	Location	Approximate Quantity
Wall Shingle Tar	Entire Exterior Wall	1,700 Square Feet
Pipe Insulation	Basement Crawl Space	120 Linear Feet
Pipe Fitting Insulation	Entire Basement	170 Linear Feet
Flashing Tar	Entire Flat Roof and Shingle Roof Flashings	316 Square Feet
Tar on Parapet Wall	Entire Main Roof	21 Square Feet
Chimney Tar	All Chimneys	60 Square Feet
Floor Felt	3 rd Floor Bathroom	54 Square Feet

Notes:

1. All quantities are To Be Determined (TBD). Field verification is necessary to confirm site conditions and the locations & quantities of ACM's identified.

CONCLUSIONS

The limited asbestos survey did identify accessible asbestos containing materials within the target areas located at 2610 Amawalk Road, Somers NY. Please find attached the laboratory sample analysis reports for your review.

Please note that based on the nature of this inspection, it is possible that unidentified materials may be uncovered and/or encountered during demolition/construction activities. If additional suspect asbestos containing materials are encountered during demolition activities, work should cease within that area of work, the area should be isolated from unauthorized entry, and the materials should be sampled for analysis to determine total asbestos content. Only through further sampling and analysis by certified personnel and the use of an accredited laboratory can a suspect material be identified as non-asbestos containing.

Additionally, if any additional identified asbestos containing materials is located, and is similar in mode of occurrence or physical properties as other identified asbestos-containing materials, it should be considered asbestos containing.

As per applicable Federal, State, and City regulations all ACM identified must be properly abated by a NYS-DOL Licensed Contractors as well as NYS-DOL Certified personnel prior to any demolition/renovation activities that could disturb these materials. Any penetrations to the ACM or impact to the intact ACM matrix would be considered a disturbance. Please note that any non-asbestos contractor performing any work that may impact the building materials must be informed of the presence and location of the ACM, and that disturbance is prohibited. In addition, the non-asbestos contractor personnel performing any work on or around ACM's must have current OSHA asbestos awareness training.

New York State Department of Labor Industrial Code Rule 56 requires that a copy of this report be immediately transmitted to the local government entity charged with issuing a permit for such demolition, renovation, remodeling or repair work under applicable State or local laws. The completed asbestos survey for controlled demolition or pre-demolition asbestos projects shall also be submitted to the appropriate Asbestos Control Bureau district office. Compliance to these requirements will be the responsibility of the building/structure owner or their agent.

Should you have any questions or require additional information, please do not hesitate to contact me at (914) 232-7355.

Sincerely,
Environmental Maintenance Contractors, Inc.
Allan Ciriaco
Vice President of Operations

Attachment(s): Laboratory Sample Results, Licenses and Certifications



ATC Group Services LLC

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New York, NY 10010
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Fax: 212-353-8306

Client: ENVIRONMENTAL MAINTENANCE CONTRACTORS
5 ANDERSON LANE
GOLDENS BRIDGE, NY 10526
Fax: (914) 232-7357 **Phone:** (914) 232-7355
Project: LA ROCCA GREEN ARCHITECT

Sample Date: 3/1/2016
Date Received : 3/17/2016
Date Analyzed : 3/18/2016
ATC Batch # 35713

Methods: EPA 600/M4-82-020
ELAP 198.1, 198.6 and 198.4

Location: 2610 Amawalk Road, Somers, NY

Bulk Asbestos Analysis Results

Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u>	<u>Asbestos</u>
				% Fibrous	% Non-Fibrous	% Type	% Type
23	3rd Floor	Linoleum (Brown)	NOB-TEM			59.9% Organic 2.4% Residue 37.7% Carbonate	NONE DETECTED
35713 -1					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: Brown Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				
27	3rd Floor	Floor Tiles	NOB-TEM			29% Organic 27.4% Residue 43.6% Carbonate	NONE DETECTED
35713 -2					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: Brown Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				
115	Roof	Roof Tar	NOB-TEM			42.2% Organic 47.7% Residue 10.1% Carbonate	NONE DETECTED
35713 -3					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: Black Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				
118	Roof	Roof Membrane	NOB-TEM			28.9% Organic 42.1% Residue 29% Carbonate	NONE DETECTED
35713 -4					0.0% Vermiculite		
Analyzed By: Ivan Reyes		Color: Black Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				



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Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u>	<u>Asbestos</u>
				% Fibrous	% Non-Fibrous	% Type	% Type

NOTES:

- 1) The Limit of Detection is the same as the Reporting Limit for these results.
- 2) The Reporting Limit (RL) is the Limit of Quantitation. For point counts the limit of quantitation of 0.25%; based on one asbestos point counter over 400 non-empty points.
- 3) Asbestos Containing Material (ACM) Definition: > 1% asbestos by weight is considered an ACM
- 4) Disclaimer: The laboratory is not responsible for sample collection. Please refer to enclosed letter. This report may not be reproduced, except in full, without written approval by ATC Group Services. This report may not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. This report relates only to the samples reported above as described in the chain of custody. Quality control data is available upon request.
- 5) Accredited by NVLAP #101187-0 and by NY State ELAP #10879
- 6) Confidentiality Notice: The document(s) contained herein are confidential and privileged information, intended for the exclusive use of the individual or entity named above
- 7) Liability Notice: ATC Group Services and its personnel shall not be liable for any misinformation provided to us by the client regarding these samples. This report relates only to samples submitted and analyzed
- 8) Asbestos results are reliable to 2 significant figures.
- 9) The condition of all samples was acceptable upon receipt.
- 10) The laboratory certifies that the test results meet all requirements of NELAP.
- 11) Supplement to test report batch # _____. Amendments: _____. Amendment Dates: _____. Amended by: _____
- 12) PLM Letter is attached on this report.
- 13) TRACE: The result is reported as Trace when No points are counted and asbestos is identified. For ELAP Trace is < 1%.
- 14) ATC Group Services certifies that this report is an accurate and authentic report of the results obtained from the laboratory analysis
- 15) The uncertainty for these test results is available upon request.
- 16) ELAP requires method ELAP 198.1 for the analysis of samples containing $\leq 10\%$ vermiculite. For samples containing > 10% vermiculite ELAP requires methods ELAP 198.1 followed by ELAP 198.6. "This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."

Ivan Reyes

Analyst:

Mohamed Fata

Analyst:

David Rivera

Analyst:

Mei Wang

Approved by

Quality Manager:

Asbestos Bulk Sample Analysis - Chain of Custody

Client: LA ROCCA GREEN ARCHITECT	DATA DELIVERY	
Site Location: 2610 ANAWALK RD. JOMERS, NY	Phone: 914-232-7355	Rush 12hr 48hr 72hr
Project: LADDEN PARK HOUSE	Fax: 914-232-7357	Other: _____
Technician: Francis Cirigaco	Email: admin@enviromain.com	Lab#: _____
Date Sampled: 3-11-2016		Turn Around Time
Cert#(s): 09-19591		
Exp. 10/2016		

[illegible]



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5 ANDERSON LANE

GOLDENS BRIDGE, NY 10526

Fax: (914) 232-7357

Phone: (914) 232-7355

Project: LA ROCCA GREEN ARCHITECT

Sample Date: 3/1/2016

Date Received : 4/1/2016

Date Analyzed : 4/9/2016

ATC Batch # 35986

Methods: EPA 600/M4-82-020

ELAP 198.1, 198.6 and 198.4

Location: 2610 Amawalk Road, Somers, NY

Bulk Asbestos Analysis Results

Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u>	<u>Asbestos</u>
				% Fibrous	% Non-Fibrous	% Type	% Type
11	3rd Floor	Base Cove Glue	NOB-TEM			33.7% Organic 15.4% Residue 50.9% Carbonate	NONE DETECTED
35986 -1		Color: Yellow			0.0% Vermiculite		
Analyzed By: Amr Fata		Second Analyst: Roman Peysakhov		Comments: PLM inconclusive, NOB-PLM inconclusive			
12	3rd Floor	Base Cove Glue	NOB-TEM			32% Organic 19.1% Residue 48.9% Carbonate	NONE DETECTED
35986 -2		Color: Yellow			0.0% Vermiculite		
Analyzed By: Amr Fata		Second Analyst: Roman Peysakhov		Comments: PLM inconclusive, NOB-PLM inconclusive			
13	3rd Floor	Base Cove Molding (Black)	NOB-TEM			44.6% Organic 23.6% Residue 31.8% Carbonate	NONE DETECTED
35986 -3		Color: Black			0.0% Vermiculite		
Analyzed By: Amr Fata		Second Analyst: Roman Peysakhov		Comments: PLM inconclusive, NOB-PLM inconclusive			
14	3rd Floor	Base Cove Molding (Black)	NOB-TEM			45.7% Organic 30.1% Residue 24.2% Carbonate	NONE DETECTED
35986 -4		Color: Black			0.0% Vermiculite		
Analyzed By: Amr Fata		Second Analyst: Roman Peysakhov		Comments: PLM inconclusive, NOB-PLM inconclusive			
15	3rd Floor	Wall Covering	NOB-TEM			92.2% Organic 2.3% Residue 5.5% Carbonate	NONE DETECTED
35986 -5		Color: Blue/Black			0.0% Vermiculite		
Analyzed By: Amr Fata		Second Analyst: Roman Peysakhov		Comments: PLM inconclusive, NOB-PLM inconclusive			
16	3rd Floor	Wall Covering	NOB-TEM			93.5% Organic 2.3% Residue 4.2% Carbonate	NONE DETECTED
35986 -6		Color: Blue/Black			0.0% Vermiculite		
Analyzed By: Amr Fata		Second Analyst: Roman Peysakhov		Comments: PLM inconclusive, NOB-PLM inconclusive			
17	3rd Floor	Linoleum Mastic	NOB-TEM			40% Organic 14.9% Residue 45.1% Carbonate	NONE DETECTED
35986 -7		Color: Black			0.0% Vermiculite		
Analyzed By: Amr Fata		Second Analyst: Roman Peysakhov		Comments: PLM inconclusive, NOB-PLM inconclusive			



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Sample #	Location	Type of Material	Method	Non-Asbestos		NOB	Asbestos
				% Fibrous	% Non-Fibrous	% Type	% Type
18	3rd Floor	Linoleum Mastic	NOB-TEM			35.5% Organic 49.4% Residue 15.1% Carbonate	NONE DETECTED
35986 -8					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
19	3rd Floor	Linoleum (Maroon)	NOB-TEM			67% Organic 4.3% Residue 28.7% Carbonate	NONE DETECTED
35986 -9					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Red Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
20	3rd Floor	Linoleum (Maroon)	NOB-TEM			64.6% Organic 6.6% Residue 28.8% Carbonate	NONE DETECTED
35986 -10					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Red Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
24	3rd Floor	Linoleum (Brown)	NOB-TEM			62.2% Organic 3.1% Residue 34.7% Carbonate	NONE DETECTED
35986 -11					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Brown Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
25	3rd Floor	Floor Felt	NOB-TEM			66.3% Organic 9.1% Residue 24.6% Carbonate	
35986 -12					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Gray/Beige Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
26	3rd Floor	Floor Felt	NOB-TEM			61.5% Organic 12.3% Residue 24.8% Carbonate	
35986 -13					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Gray/Beige Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
28	3rd Floor	Floor Tiles	NOB-TEM			40.1% Organic 24.5% Residue 35.4% Carbonate	NONE DETECTED
35986 -14					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Brown Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
29	3rd Floor	9x9 Vinyl Tile Glue	NOB-TEM			35.5% Organic 11.6% Residue 52.9% Carbonate	NONE DETECTED
35986 -15					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Yellow Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
30	3rd Floor	9x9 Vinyl Tile Glue	NOB-TEM			34.9% Organic 14.3% Residue 50.8% Carbonate	NONE DETECTED
35986 -16					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Yellow Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
31	3rd Floor	9x9 Vinyl Tile	NOB-TEM			94.8% Organic 3.4% Residue 1.8% Carbonate	NONE DETECTED
35986 -17					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				



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Sample #	Location	Type of Material	Method	Non-Asbestos		NOB	Asbestos
				% Fibrous	% Non-Fibrous	% Type	% Type
32	3rd Floor	9x9 Vinyl Tile	NOB-TEM			94.6% Organic 3.3% Residue 2.1% Carbonate	NONE DETECTED
35986 -18					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
44	2nd Floor	Wall Paper (Yellow Stripe)	NOB-TEM			84.5% Organic 2.7% Residue 12.8% Carbonate	NONE DETECTED
35986 -19					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Yellow Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
45	2nd Floor	Wall Paper (Yellow Stripe)	NOB-TEM			82.7% Organic 3.8% Residue 13.5% Carbonate	NONE DETECTED
35986 -20					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Yellow Second Analyst: Roman Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
51	2nd Floor	Base Board Glue (Bottom Layer)	NOB-TEM			63.7% Organic 24.7% Residue 11.6% Carbonate	Trace% Anthophyllite
35986 -21					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Yellow Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
						Total Asbestos: TRACE ¹³	
52	2nd Floor	Base Board Glue (Bottom Layer)	NOB-TEM			56.8% Organic 32.5% Residue 10.7% Carbonate	Trace% Anthophyllite
35986 -22					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Yellow Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
						Total Asbestos: TRACE ¹³	
53	2nd Floor	Base Board (Bottom Layer)	NOB-TEM			74.1% Organic 24.7% Residue 1.2% Carbonate	Trace% Anthophyllite
35986 -23					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
						Total Asbestos: TRACE ¹³	
54	2nd Floor	Base Board (Bottom Layer)	NOB-TEM			70.8% Organic 14.9% Residue 14.3% Carbonate	Trace% Anthophyllite
35986 -24					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
						Total Asbestos: TRACE ¹³	
55	2nd Floor	Base Cove Glue (Top Layer)	NOB-TEM			52.3% Organic 4.4% Residue 43.3% Carbonate	Trace% Anthophyllite
35986 -25					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Yellow Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
						Total Asbestos: TRACE ¹³	
56	2nd Floor	Base Cove Glue (Top Layer)	NOB-TEM			47.2% Organic 4.9% Residue 47.9% Carbonate	Trace% Anthophyllite
35986 -26					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Yellow Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
						Total Asbestos: TRACE ¹³	
57	2nd Floor	Base Cove Molding (Black)	NOB-TEM			59.6% Organic 2.3% Residue 38.1% Carbonate	Trace% Anthophyllite
35986 -27					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
						Total Asbestos: TRACE ¹³	



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Sample #	Location	Type of Material	Method	Non-Asbestos		NOB	Asbestos
				% Fibrous	% Non-Fibrous	% Type	% Type
58	2nd Floor	Base Cove Molding (Black)	NOB-TEM			63.6% Organic 2.9% Residue 33.5% Carbonate	Trace% Anthophyllite
35986 -28					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive		Total Asbestos: TRACE ¹³		
65	2nd Floor	Linoleum Mastic	NOB-TEM			42.9% Organic 38.3% Residue 18.8% Carbonate	NONE DETECTED
35986 -29					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Gray Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
66	2nd Floor	Linoleum Mastic	NOB-TEM			49.5% Organic 49.4% Residue 1.1% Carbonate	NONE DETECTED
35986 -30					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Gray Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
67	2nd Floor	Linoleum Felt	PLM	85% Cellulose	15% Mineral Filler		
35986 -31					0.0% Vermiculite		NONE DETECTED
Analyzed By: Amr Fata		Color: Gray					
68	2nd Floor	Linoleum Felt	PLM	87% Cellulose	13% Mineral Filler		
35986 -32					0.0% Vermiculite		NONE DETECTED
Analyzed By: Amr Fata		Color: Gray					
69	2nd Floor	Linoleum (Maroon)	NOB-TEM			81% Organic 17.4% Residue 1.6% Carbonate	NONE DETECTED
35986 -33					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Brown Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
70	2nd Floor	Linoleum (Maroon)	NOB-TEM			77.1% Organic 18% Residue 4.9% Carbonate	NONE DETECTED
35986 -34					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Brown Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
71	2nd Floor	Floor Felt/Glue	NOB-TEM			75.2% Organic 3.6% Residue 21.2% Carbonate	NONE DETECTED
35986 -35					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
72	2nd Floor	Floor Felt/Glue	NOB-TEM			96.4% Organic 1.6% Residue 2% Carbonate	NONE DETECTED
35986 -36					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
73	2nd Floor	9x9 Vinyl Tile	NOB-TEM			93.4% Organic 2.9% Residue 3.7% Carbonate	NONE DETECTED
35986 -37					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				



ATC Group Services LLC

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Sample #	Location	Type of Material	Method	Non-Asbestos		NOB	Asbestos
				% Fibrous	% Non-Fibrous	% Type	% Type
74	2nd Floor	9x9 Vinyl Tile	NOB-TEM			89.6% Organic 3.1% Residue 7.3% Carbonate	NONE DETECTED
35986 -38					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
75	2nd Floor	Linoleum (Brown)	NOB-TEM			56.2% Organic 2.8% Residue 41% Carbonate	NONE DETECTED
35986 -39					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Brown Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				
76	2nd Floor	Linoleum (Brown)	NOB-TEM			55.9% Organic 2.5% Residue 41.6% Carbonate	NONE DETECTED
35986 -40					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Brown Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				
97	1st Floor	Base Cove Glue (White)	NOB-TEM			36% Organic 8.1% Residue 55.9% Carbonate	NONE DETECTED
35986 -41					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: White Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				
98	1st Floor	Base Cove Glue (White)	NOB-TEM			32.2% Organic 4.3% Residue 63.5% Carbonate	NONE DETECTED
35986 -42					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: White Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				
99	1st Floor	Base Cove Molding (White)	NOB-TEM			78.4% Organic 2.8% Residue 18.8% Carbonate	NONE DETECTED
35986 -43					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: White Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				
100	1st Floor	Base Cove Molding (White)	NOB-TEM			62.2% Organic 2% Residue 35.8% Carbonate	NONE DETECTED
35986 -44					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: White Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				
101	1st Floor	Base Cove Glue (Beige)	NOB-TEM			87.9% Organic 11.8% Residue 0.3% Carbonate	NONE DETECTED
35986 -45					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Beige Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				
102	1st Floor	Base Cove Glue (Beige)	NOB-TEM			88% Organic 11.2% Residue 0.8% Carbonate	NONE DETECTED
35986 -46					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Beige Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				
103	1st Floor	Base Cove Molding (Grey)	NOB-TEM			69.2% Organic 24.1% Residue 6.7% Carbonate	NONE DETECTED
35986 -47					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Beige Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				



ATC Group Services LLC

104 E. 25th Street, 10th Floor

New York, NY 10010

Tel. 212-353-8280

Fax: 212-353-8306

Sample #	Location	Type of Material	Method	Non-Asbestos		NOB	Asbestos
				% Fibrous	% Non-Fibrous	% Type	% Type
104	1st Floor	Base Cove Molding (Grey)	NOB-TEM			60.5% Organic 37.9% Residue 1.6% Carbonate	NONE DETECTED
35986 -48					0.0% Vermiculite		
		Color: Beige					
Analyzed By: Amr Fata		Second Analyst: David Rivera		Comments: PLM inconclusive, NOB-PLM inconclusive			
105	1st Floor	Floor Tile Mastic	NOB-TEM			90.1% Organic 9.4% Residue 0.5% Carbonate	NONE DETECTED
35986 -49					0.0% Vermiculite		
		Color: Black					
Analyzed By: Amr Fata		Second Analyst: David Rivera		Comments: PLM inconclusive, NOB-PLM inconclusive			
106	1st Floor	Floor Tile Mastic	NOB-TEM			84.9% Organic 12.6% Residue 2.5% Carbonate	NONE DETECTED
35986 -50					0.0% Vermiculite		
		Color: Black					
Analyzed By: Amr Fata		Second Analyst: David Rivera		Comments: PLM inconclusive, NOB-PLM inconclusive			
107	1st Floor	12"x12" Floor Tile	NOB-TEM			44.8% Organic 2% Residue 53.2% Carbonate	NONE DETECTED
35986 -51					0.0% Vermiculite		
		Color: Off White					
Analyzed By: Amr Fata		Second Analyst: David Rivera		Comments: PLM inconclusive, NOB-PLM inconclusive			
108	1st Floor	12"x12" Floor Tile	NOB-TEM			28% Organic 3% Residue 69% Carbonate	NONE DETECTED
35986 -52					0.0% Vermiculite		
		Color: Off White					
Analyzed By: Amr Fata		Second Analyst: David Rivera		Comments: PLM inconclusive, NOB-PLM inconclusive			
116	Roof	Roof Felt	PLM	3% Cellulose 10% FiberGlass	87% Mineral Filler		NONE DETECTED
35986 -53					0.0% Vermiculite		
		Color: White					
Analyzed By: Amr Fata							
117	Roof	Roof Felt	PLM	5% Cellulose 12% FiberGlass	83% Mineral Filler		NONE DETECTED
35986 -54					0.0% Vermiculite		
		Color: White					
Analyzed By: Amr Fata							
119	Roof	Roof Membrane	NOB-TEM			65.1% Organic 32.8% Residue 2.1% Carbonate	NONE DETECTED
35986 -55					0.0% Vermiculite		
		Color: Black					
Analyzed By: Amr Fata		Second Analyst: David Rivera		Comments: PLM inconclusive, NOB-PLM inconclusive			
120	Roof	Roof Membrane	NOB-TEM			63.2% Organic 36.3% Residue 0.5% Carbonate	NONE DETECTED
35986 -56					0.0% Vermiculite		
		Color: Black					
Analyzed By: Amr Fata		Second Analyst: David Rivera		Comments: PLM inconclusive, NOB-PLM inconclusive			
121	Roof	Flashing Tar	NOB-PLM			82.2% Organic 8.7% Residue 0.3% Carbonate	8.8% Chrysotile
35986 -57					0.0% Vermiculite		
		Color: Black					
Analyzed By: Amr Fata		Second Analyst: Mohamed Fata		Comments: PLM inconclusive			
							Total Asbestos: 8.8 %



ATC Group Services LLC

104 E. 25th Street, 10th Floor

New York, NY 10010

Tel. 212-353-8280

Fax: 212-353-8306

Sample #	Location	Type of Material	Method	Non-Asbestos		NOB	Asbestos
				% Fibrous	% Non-Fibrous	% Type	% Type
122	Roof	Flashing Tar	NOB-PREP			84.1% Organic 14% Residue 19% Carbonate	NOT ANALYZED
35986 -58							
Analyzed By: Amr Fata		Color: Black	Comments: PLM inconclusive, not analyzed by NOB PLM, positive stop, see #121				
123	Roof	Sloped Roof Felt	NOB-TEM			90.7% Organic 2.4% Residue 6.9% Carbonate	NONE DETECTED
35986 -59					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black	Comments: PLM inconclusive, NOB-PLM inconclusive				
		Second Analyst: David Rivera					
124	Roof	Sloped Roof Felt	NOB-TEM			84.8% Organic 3.6% Residue 11.6% Carbonate	NONE DETECTED
35986 -60					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black	Comments: PLM inconclusive, NOB-PLM inconclusive				
		Second Analyst: David Rivera					
125	Roof	Sloped Roof Shingles	NOB-TEM			44.9% Organic 29.4% Residue 25.7% Carbonate	NONE DETECTED
35986 -61					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black	Comments: PLM inconclusive, NOB-PLM inconclusive				
		Second Analyst: David Rivera					
126	Roof	Sloped Roof Shingles	NOB-TEM			36.5% Organic 17.9% Residue 45.6% Carbonate	NONE DETECTED
35986 -62					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black	Comments: PLM inconclusive, NOB-PLM inconclusive				
		Second Analyst: David Rivera					
127	Roof	Tar on Parapet Wall	NOB-PLM			81.9% Organic 6.3% Residue 5.4% Carbonate	6.4% Chrysotile
35986 -63					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black	Comments: PLM inconclusive				
		Second Analyst: Mohamed Fata	Total Asbestos: 6.4 %				
128	Roof	Tar on Parapet Wall	NOB-PREP			63.8% Organic 28.6% Residue 7.6% Carbonate	NOT ANALYZED
35986 -64							
Analyzed By: Amr Fata		Color: Black	Comments: PLM inconclusive, not analyzed by NOB PLM, positive stop, see #127				
129	Exterior	Wall Shingle Felt	NOB-TEM			91.8% Organic 4% Residue 4.2% Carbonate	NONE DETECTED
35986 -65					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black	Comments: PLM inconclusive, NOB-PLM inconclusive				
		Second Analyst: David Rivera					
130	Exterior	Wall Shingle Felt	NOB-TEM			93.5% Organic 2.7% Residue 3.8% Carbonate	NONE DETECTED
35986 -66					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black	Comments: PLM inconclusive, NOB-PLM inconclusive				
		Second Analyst: David Rivera					
133	Roof	Chimney Tar	NOB-PLM			77.2% Organic 10.8% Residue 2% Carbonate	10% Chrysotile
35986 -67					0.0% Vermiculite		
Analyzed By: Amr Fata		Color: Black	Comments: PLM inconclusive				
		Second Analyst: Mohamed Fata	Total Asbestos: 10 %				



BULK ASBESTOS ANALYSIS RESULTS

PLM Analysis Methodology

The samples were analyzed by industry accepted methods in accordance with EPA and ELAP methods using Polarized Light Microscopy (PLM) with dispersion staining in conjunction with stereoscopical analysis. Point counts are performed on samples regulated by these agencies. The Environmental Laboratory Approval Program (ELAP) has determined that analysis of non-friable organically bound materials (i.e. floor tile, roofing, etc.) and ceiling tiles with cellulose is not reliable when performed by Polarized Light Microscopy (PLM) method. Therefore, if this analysis included that of non-friable materials or ceiling tiles with cellulose under PLM and the results were negative, ATC must add this disclaimer to maintain our ELAP accreditation:

"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 this material can be considered or treated as non-asbestos containing".

Non-friable samples that contained *Trace* or *No* PLM detectable asbestos are classified as Inconclusive. Samples that are layered and analyzed by the gravimetric method as composites (NESHAP, AHERA) should be considered positive if results are between trace and 1%, unless every layer is analyzed separately.

ELAP requires method ELAP 198.1 for the analysis of samples containing $\leq 10\%$ vermiculite with the exception of sprayed-on fireproofing containing vermiculite (SOF-V). For samples containing $>10\%$ vermiculite ELAP requires methods ELAP 198.1 followed by ELAP 198.6. This method has limitations for identification and quantification of vermiculite. "This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."

ELAP requires method ELAP 198.8 for the analysis of sprayed-on fireproofing containing vermiculite (SOF-V). Sample results for SOF-V tested by other methods upon client requests are inconclusive.

EPA does not regulate mixed mineral assemblage like the anthophyllite-talc intergrowth that is found in paint and caulking unless these materials contain asbestos in an amount greater than 1%. Anthophyllite detected in paint and caulking samples might be a talc intergrowth.

ATC has the capability of performing TEM confirmation if so desired.

Bulk sample reports are checked and reviewed two times. Unused portions of samples are archived for two months unless client requests special handling. This report must not be used by the client to claim product endorsement by NIST or any agency of the U.S. government.

ATC is not responsible for sample collection and analytical procedures not performed by our laboratory. This report may not be reproduced in part without the laboratory permission.

ATC will not be liable for analytical results from samples that are not prepared according to the standard methods (EPA, ELAP, etc.) used by the laboratory (e.g. composite samples from different locations, samples with insufficient volumes, straight TEM samples without gravimetric procedures, dust samples, non-friable samples by PLM only).

Laboratory Equipment

Laboratory analysis was accomplished utilizing Olympus BH-2 Microscopes.

Quality Control

ATC is accredited by NVLAP (Lab Code 101187-0) and NY State DOH ELAP (Lab ID 10879) for bulk and air fiber analyses. ATC participates in the Bulk Asbestos Sample Quality Assurance Programs for NVLAP and ELAP and maintains an in-house QC/QA program for bulk samples whereby 10% of all submitted samples are reanalyzed and documented in a Quality Control Manual. ATC also participates in a quarterly round robin QC/QA program for bulk samples with several accredited laboratories throughout the United States. Current and past QC/QA program results are available in the laboratory for inspection.

Accuracy and Precision

The phase abundances provided by point count may be considered within the limits of variability inherent in the method employed. For point counts the detection limit of 0.25% is based on one asbestos point counted over 400 non-empty points. If no points are counted and asbestos is identified, the result will be reported as trace. For ELAP trace is $< 1\%$.

The analyses were supervised by Milena Bonezzi, Director of Laboratory Services, who has extensive experience in asbestos analysis by PLM and other methods. Please contact me regarding any questions relating to these materials at 212-353-8280 Ext. 247.

1. EPA Methods: 600/M4-82-020
2. ELAP Method: 4088 Items 198.1 and 198.4 and 198.6 and 198.8

Sincerely,

Milena Bonezzi
ATC Group Services LLC
Director of Laboratory Services

Asbestos Bulk Sample Analysis - Chain of Custody

35986

Client: LA POCCA GREEN MCHINTY
Site Location: 2010 AVALARKE RD SOMERSET, VT
Project: LABOR PARK HOUSE Date Sampled: 3-7-2016
Technician: Francis Cirriaco Cert#(s): 09-19591 Exp. 10/2016

DATA DELIVERY
Phone: 914-232-7355
Fax: 914-232-7357
Email: admin@enviromain.com

	Turn Around Time			
	12hr	24hr	48hr	72hr
Rush				
Other:				
Lab#:				

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
11	4	BASE COVE GUE	3rd Floor	N		<p>Please Stop on First Positive for each Group</p> <p>20 NOB Dec 196 20 NOB Dec 4/1/16</p> <p>49 NOB Dec 196 46 NOB Dec 196 43 NOB Dec 196</p> <p>TECHNICAL BLUE</p> <p>4/1/16 201.48</p>
12	4	" " "				
13	4	BASE COVE MOLDING (BACK)				
14	4	" " " "				
15	5	WALL COVERING				
16	5	" "				
17	6	LINOLEUM MARBLE				
18	6	" "				
19	7	LINOLEUM (MAROON)				
20	7	" "				
24	9	LINOLEUM (BROWN)				<p>Drawing/Sketch (Required)</p> <p>4/1/16 201.48</p>
25	10	FLOOR FELT				
26	10	" "				
28	11	FLOOR TILES				
29	12	9X9 VINYL TILE GUE	3rd Floor	N		
Sampled By: (Signature)		Date	Relinquished By: (Signature)		Date	<p>4/30/16</p> <p>4/30/16</p> <p>65 PL</p>
1)			3)			
Printed Name: Francis Ciraco		Time	Printed Name:		Time	
Relinquished By: (Signature)		Date	Relinquished By: (Signature)		Date	
2)			4)			
Printed Name:		Time	Printed Name:		Time	

Asbestos Bulk Sample Analysis - Chain of Custody

35986

Client: LA POCCA GREEN ARCHITECT
 Site Location: 2610 AKAWAUK RD. JONENY, NY
 Project: LABORATORY HOUSE Date Sampled: 3-1-2016
 Technician: Francis Ciriaco Cert#(s): 09-19591 Exp: 10/2016

DATA DELIVERY
 Phone: 914-232-7355
 Fax: 914-232-7357
 Email: admin@enviromain.com

Turn Around Time
 Rush 12hr 24hr 48hr 72hr
 Other: _____
 Lab#: _____

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
30	19	9x9 VINYL TILE GUE	3rd Floor	N		Please Stop on First Positive for each Group
31	13	9x9 VINYL TILE	↓			
32	13	" " "	3rd Floor			
44	16	WALL PAPER (YELLOW STRIPS)	2nd Floor			
45	16	" " "				
51	19	BASE BOARD GUE (BOTTOM)				
52	19	" " "				
53	19	BASE BOARD (BOTTOM CENTER)				
54	19	" " "				
55	19	BASE BOE GUE (TOP CENTER)				
56	19	" " "				Drawing/Sketch (Required)
57	19	BASE BOE NEEDING (BACK)				
58	19	" " "				
65	23	LINOLEUM MASTIC				
66	23	" "	2nd Floor	N		

Sampled By: (Signature) [Signature] Date _____

Printed Name: Francis Ciriaco Time _____

Relinquished By: (Signature) _____ Date _____

Printed Name: _____ Time _____

Relinquished By: (Signature) [Signature] Date 4/1/16

Printed Name: _____ Time 14:07

for Laboratory Use

Analyzed by: ATC - A-2nd

4/13/16

4:30 AM

Asbestos Bulk Sample Analysis - Chain of Custody

35986 ✓

Client: LA POCCA GREEN ARCHITECT
 Site Location: 2610 AVEWALK RD. JENKINS, NY
 Project: MAISON PAINE HOUSE Date Sampled: 3-1-2016
 Technician: Francis Ciriaco Cert#(s): 09-19591 Exp. 10/2016

DATA DELIVERY
 Phone: 914-232-7355
 Fax: 914-232-7357
 Email: admin@enviromain.com

Turn Around Time
 Rush 12hr 24hr 48hr 72hr
 Other: _____
 Lab#: _____

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
67	24	LINOLEUM FELT	2nd Floor	N		Please Stop on First Positive for each Group Analyzed by <u>JB</u> <u>D. Zivie JR</u> <u>4/9/16 05:13 PM</u>
68	24	" "				
69	25	LINOLEUM NAARON				
70	25	" "				
71	26	FLOOR FELT/GUAE				
72	26	" " "				
73	22	9x9 VINYL TILE				
74	22	" " "				
75	26	LINOLEUM (BROWN)				
76	26	" "	2nd Floor			
97	36	BASE COVE GUAE (WHITE)	1ST Floor			Drawing/Sketch (Required) Analyzed by <u>JB</u> <u>4/31/16</u> <u>4:30 AM</u>
98	36	" " "				
99	36	BASE COVE NAARON (WHITE)				
100	36	" " "				
101	37	BASE COVE GUAE (BEIGE)	1ST Floor	N		

Sampled By: (Signature) [Signature] Date _____

1) Printed Name: Francis Ciriaco Time _____

Relinquished By: (Signature) _____ Date _____

2) Printed Name: _____ Time _____

Relinquished By: (Signature) _____ Date _____

3) Printed Name: _____ Time _____

Relinquished By: (Signature) ARACIO/CB Date 4/1/16

4) Printed Name: _____ Time 4:30 AM

Asbestos Bulk Sample Analysis - Chain of Custody

35986

Turn Around Time

Rush 12hr 24hr 48hr 72hr

Other:

Lab#:

DATA DELIVERY

Phone: 914-232-7355

Fax: 914-232-7357

Email: admin@enviomain.com

Client: LA POCCA GREEN ARCHITECT

Site Location: 2610 AVALON RD. JERSEY, NJ

Project: JASON PARK HOUSE Date Sampled: 3-1-2016

Technician: Francis Ciriaco Cert#(s): 09-19591 Exp. 10/2016

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
102	37	BASE COVE CURT (BEICE)	1ST FLOOR	N		<p>Please Stop on First Positive for each Group</p> <p>Analytically Ben</p> <p>D. Rivera</p> <p>4/9/16 05:30pm</p>
103	38	BASE COVE HOLDING (GAST)				
104	38	" " " "				
105	39	FLOOR TILE MASTIC				
106	39	" " " "				
107	40	1/2" x 1/2" FLOOR TILE				
108	40	" " " "	1ST FLOOR			
116	43	ROOF FELT	ROOF			
117	43	" " " "				
119	43	ROOF MEMBRANE				
120	43	" " " "				<p>Drawing/Sketch (Required)</p> <p>Analyzed By:</p> <p>AR-A-24-</p> <p>4/31/16</p> <p>4:30 A</p>
121	44	FLASHING TAN				
122	44	" " " "				
123	45	SLOPED ROOF FELT				
124	45	" " " "	ROOF	N		
Sampled By: (Signature)		Date	Relinquished By: (Signature)		Date	
1) Printed Name: Francis Ciriaco		Time	3) Printed Name:		Time	
2) Relinquished By: (Signature)		Date	4) Relinquished By: (Signature)		Date	
Printed Name:		Time	Printed Name:		Time	
			For Laboratory Use			

Asbestos Bulk Sample Analysis - Chain of Custody

35986

Client: LA POCCA GREEN ARCHITECT
 Site Location: 2610 ALEXANDER RD. YONKERS, NY
 Project: LABORATORY HOUSE Date Sampled: 3-1-2016
 Technician: Francis Ciriaco Cert#(s): 09-19591 Exp: 10/2016

DATA DELIVERY
 Phone: 914-232-7355
 Fax: 914-232-7357
 Email: admin@enviromain.com

Turn Around Time
 Rush 12hr 24hr 48hr 72hr
 Other: _____
 Lab#: _____

Field #	Group	Sample Description	Location	Frangible Y/N	Asbestos Content	Notes
125	45	ROOF ROOF SHINGLES	ROOF	N		Please Stop on First Positive for each Group Analyzed by Ben D. Rivers Jr 4/9/16 05:38pm
126	45	" " "				
127	46	TAN ON PARAPET WALL				
128	46	" " " "	ROOF			
129	47	WALL SHINGLE FELT	EXTENSION			
130	47	" " "	"			Drawing/Sketch (Required) Analyzed by = ATE 4-7-16 4/30/16
133	49	CHIMNEY TAN	ROOF			
134	49	" " "	"			
136	50	WINDOW CASING	EXTENSION	N		
Sampled By: (Signature)		Date		Relinquished By: (Signature)		Date
1) <u>Francis Ciriaco</u>		Time		3) <u>ATE</u>		Time
Relinquished By: (Signature)		Date		Printed Name:		Time
2) <u>Francis Ciriaco</u>		Time		Printed Name:		Time
Printed Name:		Time		Printed Name:		Time



ATC Group Services LLC
GRAVIMETRIC (NOB) ANALYSIS SHEET

Client/Project: EMC PLM Batch # 35986 Start Date: 04/03/16
NOB PLM PREP: SA NOB PLM Analyst: M.J.G/MF NOB TEM PREP: M.J.G/WR NOB TEM Analyst: RP/MP Date Completed: 04/04-05/16

Field #	5	11	12	9	13	Notes	Methods		
							NOB	PLM	TEM
	% Organic	Non Ash Residue % NFr	% Carbonate	Asbestos Types or Vermiculite	% Total Asbestos or Vermiculite		PREP		
51	63.7	24.7	11.6	Anthophyllite	TR		✓	✓	✓
52	56.8	32.5	10.7	Anthophyllite	TR		✓	✓	✓
53	74.1	24.7	1.2	Anthophyllite	TR		✓	✓	✓
54	70.8	14.9	14.3	Anthophyllite	TR		✓	✓	✓
55	52.3	4.4	43.3	Anthophyllite	TR		✓	✓	✓
56	47.2	4.9	47.9	Anthophyllite	TR		✓	✓	✓



ATC Group Services LLC
GRAVIMETRIC (NOB) ANALYSIS SHEET

Client/Project: EMC PLM Batch # 35986 Start Date: 04/03/16
NOB PLM PREP: SA NOB PLM Analyst: MJG/MF NOB TEM PREP: MJG/WR NOB TEM Analyst: RP/MP Date Completed: 04/04-05/16

Field #	5 %	11 Non Asb Residue % Nfr	12 %	9 Asbestos Types or Vermiculite	13 % Total Asbestos or Vermiculite	Notes	Methods		
							NOB	PLM	TEM
11	33.7	15.4	50.9	ND			✓	✓	✓
12	32.0	19.1	48.9	ND			✓	✓	✓
13	44.6	23.6	31.8	ND			✓	✓	✓
14	45.7	30.1	24.2	ND			✓	✓	✓
15	92.2	2.3	5.5	ND			✓	✓	✓
16	93.5	2.3	4.2	ND			✓	✓	✓
17	40.0	14.9	45.1	ND			✓	✓	✓
18	35.5	49.4	15.1	ND			✓	✓	✓
19	67.0	4.3	28.7	ND			✓	✓	✓
20	64.6	6.6	28.8	ND			✓	✓	✓



ATC Group Services LLC
GRAVIMETRIC (NOB) ANALYSIS SHEET

Client/Project: EMC PLM Batch # 35986 Start Date: 04/03/16
NOB PLM PREP: SA NOB PLM Analyst: M/G/MF NOB TEM PREP: M/G/MR NOB TEM Analyst: RP/MP Date Completed: 04/04-05/16

Field #	5 %	11 Non Ash Residue % NFr	12 %	9 Asbestos Types or Vermiculite	13 % Total Asbestos or Vermiculite	Notes	Methods		
							NOB	PLM	TEM
24	62.2	3.1	34.7	ND			✓	✓	✓
25	66.3	9.1	24.6	Tremolite	TR		✓	✓	✓
26	61.5	12.3	24.8	Tremolite	1.4		✓	✓	✓
28	40.1	24.5	35.4	ND			✓	✓	✓
29	35.5	11.6	52.9	ND			✓	✓	✓
30	34.9	14.3	50.8	ND			✓	✓	✓
31	94.8	3.4	1.8	ND			✓	✓	✓
32	94.6	3.3	2.1	ND			✓	✓	✓
44	84.5	2.7	12.8	ND			✓	✓	✓
45	82.7	3.8	13.5	ND			✓	✓	✓



ATC Group Services LLC
GRAVIMETRIC (NOB) ANALYSIS SHEET

Client/Project: EMC PLM Batch # 35986 Start Date: 04/03/16
NOB PLM PREP: SA NOB PLM Analyst: MUG/MF NOB TEM PREP: MUG/MR NOB TEM Analyst: RP/MP Date Completed: 04/04-05/16

Field #	5	11	12	9	13	Notes	Methods		
							NOB	PLM	TEM
	% Organic	Non Ash Residue % Nfr	% Carbonate	Asbestos Types or Vermiculite	% Total Asbestos or Vermiculite				
51	63.7	24.7	11.6	Anthophyllite	TR		✓	✓	✓
52	56.8	32.5	10.7	Anthophyllite	TR		✓	✓	✓
53	74.1	24.7	1.2	Anthophyllite	TR		✓	✓	✓
54	70.8	14.9	14.3	Anthophyllite	TR		✓	✓	✓
55	52.3	4.4	43.3	Anthophyllite	TR		✓	✓	✓
56	47.2	4.9	47.9	Anthophyllite	TR		✓	✓	✓

Note 1: Methods: ELAP as per items 198.6 and 198.4.
Note 2: Vermiculite not reported = not detected.
Page 3
Client Copy



ATC Group Services LLC
GRAVIMETRIC (NOB) ANALYSIS SHEET

Client/Project: EMC NOB PLM Batch # 35986 Start Date: 04/03/16
NOB PLM PREP: SA NOB PLM Analyst: M/G/MF NOB TEM PREP: M/G/WR NOB TEM Analyst: RP/MP Date Completed: 04/04-05/16

Field #	5 %	11 Non Asb Residue % NFI		12 %	9 Asbestos Types or Vermiculite	13 % Total Asbestos or Vermiculite	Notes	Methods		
								NOB	PLM	TEM
57	59.6	2.3		38.1	Anthophyllite	TR		✓	✓	✓
58	63.6	2.9		33.5	Anthophyllite	TR		✓	✓	✓
65	42.9	38.3		18.8	ND			✓	✓	✓
66	49.5	49.4		1.1	ND			✓	✓	✓
69	81.0	17.4		1.6	ND			✓	✓	✓
70	77.1	18.0		4.9	ND			✓	✓	✓
71	75.2	3.6		21.2	ND			✓	✓	✓
72	96.4	1.6		2.0	ND			✓	✓	✓
73	93.4	2.9		3.7	ND			✓	✓	✓
74	89.6	3.1		7.3	ND			✓	✓	✓



ATC Group Services LLC
GRAVIMETRIC (NOB) ANALYSIS SHEET

Client/Project: EMC PLM Batch # 35986A TEM Batch # 85084 Start Date: 04/08/16
NOB PLM PREP: SA NOB PLM Analyst: MF NOB TEM PREP: DR NOB TEM Analyst: DR Date Completed: 04/09/16

Field #	5 % Organic	11 Non Asb Residue % Nfr		12 % Carbonate	9 Asbestos Types or Vermiculite	13 % Total Asbestos or Vermiculite	Notes	Methods		
								NOB	PLM	TEM
								PREP	PLM	TEM
75	56.2	2.8	41.0	ND				✓	✓	✓
76	55.9	2.5	41.6	ND				✓	✓	✓
97	36.0	8.1	55.9	ND				✓	✓	✓
98	32.2	4.3	63.5	ND				✓	✓	✓
99	78.4	2.8	18.8	ND				✓	✓	✓
100	62.2	2.0	35.8	ND				✓	✓	✓
101	87.9	11.8	0.3	ND				✓	✓	✓
102	88.0	11.2	0.8	ND				✓	✓	✓
103	69.2	24.1	6.7	ND				✓	✓	✓
104	60.5	37.9	1.6	ND				✓	✓	✓

Note 1: Methods: ELAP as per items 198.6 and 198.4.

Note 2: Vermiculite not reported = not detected.



ATC Group Services LLC
GRAVIMETRIC (NOB) ANALYSIS SHEET

Client/Project: EMC PLM Batch # 35986A TEM Batch # 85084 Start Date: 04/08/16
NOB PLM PREP: SA NOB PLM Analyst: MF NOB TEM PREP: DR NOB TEM Analyst: DR Date Completed: 04/09/16

Field #	5 % Organic	11 Non Ash Residue % MF	12 % Carbonate	9 Asbestos Types or Vermiculite	13 % Total Asbestos or Vermiculite	Notes	Methods		
							NOB	PLM	TEM
							PREP		
105	90.1	9.4	0.5	ND			✓	✓	✓
106	84.9	12.6	2.5	ND			✓	✓	✓
107	44.8	2.0	53.2	ND			✓	✓	✓
108	28.0	3.0	69.0	ND			✓	✓	✓
119	65.1	32.8	2.1	ND			✓	✓	✓
120	63.2	36.3	0.5	ND			✓	✓	✓
121	82.2	8.7	0.3	Chrysotile	8.8		✓	✓	✓
122	84.1	14.0	1.9	NA		Positive Stop	✓	✓	✓
123	90.7	2.4	6.9	ND			✓	✓	✓
124	84.8	3.6	11.6	ND			✓	✓	✓



ATC Group Services LLC
GRAVIMETRIC (NOB) ANALYSIS SHEET

Client/Project: EMC PLM Batch # 35986A TEM Batch # 85084 Start Date: 04/08/16
NOB PLM PREP: SA NOB PLM Analyst: MF NOB TEM PREP: DR NOB TEM Analyst: DR Date Completed: 04/09/16

Field #	5 % Organic	11 Non Asb Residue % M/T	12 % Carbonate	9 Asbestos Types or Vermiculite	13 % Total Asbestos or Vermiculite	Notes	Methods		
							NOB	PLM	TEM
125	44.9	29.4	25.7	ND			✓	✓	✓
126	36.5	17.9	45.6	ND			✓	✓	✓
127	81.9	6.3	5.4	Chrysotile	6.4		✓	✓	
128	63.8	28.6	7.6	NA		Positive Stop	✓		
129	91.8	4.0	4.2	ND			✓	✓	✓
130	93.5	2.7	3.8	ND			✓	✓	✓
133	77.2	10.8	2.0	Chrysotile	10		✓	✓	
134	86.0	12.5	1.5	NA		Positive Stop	✓		
136	17.7	31.5	50.8	ND			✓	✓	✓

Note 1: Methods: ELAP as per items 198.6 and 198.4.

Note 2: Vermiculite not reported = not detected.



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Client: ENVIRONMENTAL MAINTENANCE CONTRACTORS

5 ANDERSON LANE

GOLDENS BRIDGE, NY 10526

Fax: (914) 232-7357

Phone: (914) 232-7355

Project: LA ROCCA GREEN ARCHITECT

Sample Date: 3/1/2016

Date Received : 3/15/2016

Date Analyzed : 3/16/2016

ATC Batch # 35685

Methods: EPA 600/M4-82-020

ELAP 198.1, 198.6 and 198.4

Location: 2610 AMAWALK RD., SOMERS, NY

Bulk Asbestos Analysis Results

Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u>	<u>Asbestos</u>
				% Fibrous	% Non-Fibrous	% Type	% Type
1	3rd Floor	Joint Compound	PLM		100% Mineral Filler		
35685 -1					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White.					
2	3rd Floor	Joint Compound	PLM		100% Mineral Filler		
35685 -2					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					
3	3rd Floor	Sheetrock	PLM	10% Cellulose	90% Mineral Filler		
35685 -3					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Gray					
4	3rd Floor	Sheetrock	PLM	5% Cellulose	95% Mineral Filler		
35685 -4					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Gray					
5	3rd Floor	Plaster Brown	PLM	Trace% Cellulose	100% Mineral Filler		
35685 -5					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
6	3rd Floor	Plaster White	PLM		100% Mineral Filler		
35685 -6					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					
7	3rd Floor	Plaster Brown	PLM	Trace% Cellulose	100% Mineral Filler		
35685 -7					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					



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Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u>	<u>Asbestos</u>
				% Fibrous	% Non-Fibrous	% Type	% Type
8	3rd Floor	Plaster White	PLM		100% Mineral Filler		
35685 -8					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					
9	3rd Floor	Plaster Brown	PLM	Trace% Cellulose	100% Mineral Filler		
35685 -9					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
10	3rd Floor	Plaster White	PLM		100% Mineral Filler		
35685 -10					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					
31	3rd Floor	9x9 Vinyl Tile					
35685 -11							NOT ANALYZED
Comments: MISSING							
35	3rd Floor	Stucco	PLM		100% Mineral Filler		
35685 -12					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
36	3rd Floor	Stucco	PLM		100% Mineral Filler		
35685 -13					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
37	3rd Floor	Stucco	PLM		100% Mineral Filler		
35685 -14					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
38	2nd Floor	Plaster Brown	PLM		100% Mineral Filler		
35685 -15					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
39	2nd Floor	Plaster White	PLM		100% Mineral Filler		
35685 -16					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					
40	2nd Floor	Plaster Brown	PLM		100% Mineral Filler		
35685 -17					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					



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Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u> % Type	<u>Asbestos</u> % Type
				% Fibrous	% Non-Fibrous		
41	2nd Floor	Plaster White	PLM		100% Mineral Filler		
35685 -18					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					
42	2nd Floor	Plaster Brown	PLM		100% Mineral Filler		
35685 -19					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
43	2nd Floor	Plaster White	PLM		100% Mineral Filler		
35685 -20					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					
46	2nd Floor	Stucco	PLM		100% Mineral Filler		
35685 -21					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
47	2nd Floor	Stucco	PLM		100% Mineral Filler		
35685 -22					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
48	2nd Floor	Stucco	PLM		100% Mineral Filler		
35685 -23					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
49	2nd Floor	Wall Paper (Blue Stripe)	PLM	95% Cellulose	5% Mineral Filler		
35685 -24					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
50	2nd Floor	Wall Paper (Blue Stripe)	PLM	97% Cellulose	3% Mineral Filler		
35685 -25					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
59	2nd Floor	Ceramic Wall Tile Grout	PLM		100% Mineral Filler		
35685 -26					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					
60	2nd Floor	Ceramic Wall Tile Grout	PLM		100% Mineral Filler		
35685 -27					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					



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Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u> % Type	<u>Asbestos</u> % Type
				% Fibrous	% Non-Fibrous		
61	2nd Floor	Wall Paper (Tan)	PLM	96% Cellulose	4% Mineral Filler		
35685 -28					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Tan					
62	2nd Floor	Wall Paper (Tan)	PLM	95% Cellulose	5% Mineral Filler		
35685 -29					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Tan					
63	2nd Floor	Wall Paper (White Floral)	PLM	87% Cellulose	13% Mineral Filler		
35685 -30					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Tan					
64	2nd Floor	Wall Paper (White Floral)	PLM	90% Cellulose	10% Mineral Filler		
35685 -31					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Tan					
87	1st Floor	Joint Compound	PLM		100% Mineral Filler		
35685 -32					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					
88	1st Floor	Joint Compound	PLM		100% Mineral Filler		
35685 -33					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					
89	1st Floor	Sheetrock	PLM	10% Cellulose	90% Mineral Filler		
35685 -34					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					
90	1st Floor	Sheetrock	PLM	15% Cellulose	85% Mineral Filler		
35685 -35					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					
91	1st Floor	Plaster Brown	PLM		100% Mineral Filler		
35685 -36					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
92	1st Floor	Plaster White	PLM		100% Mineral Filler		
35685 -37					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: White					



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Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u> % Type	<u>Asbestos</u> % Type
				% Fibrous	% Non-Fibrous		
93	1st Floor	Plaster Brown	PLM		100% Mineral Filler		
35685 -38					0.0% Vermiculite		NONE DETECTED
		Color: Brown					
Analyzed By: Tarek Fata							
94	1st Floor	Plaster White	PLM		100% Mineral Filler		
35685 -39					0.0% Vermiculite		NONE DETECTED
		Color: White					
Analyzed By: Tarek Fata							
95	1st Floor	Plaster Brown	PLM		100% Mineral Filler		
35685 -40					0.0% Vermiculite		NONE DETECTED
		Color: Brown					
Analyzed By: Tarek Fata							
96	1st Floor	Plaster White	PLM		100% Mineral Filler		
35685 -41					0.0% Vermiculite		NONE DETECTED
		Color: White					
Analyzed By: Tarek Fata							
109	Attic	Attic Insulation	PLM	3% Cellulose 85% FiberGlass	12% Mineral Filler		
35685 -42					0.0% Vermiculite		NONE DETECTED
		Color: Gray					
Analyzed By: Tarek Fata							
110	Attic	Attic Insulation	PLM	5% Cellulose 85% FiberGlass	10% Mineral Filler		
35685 -43					0.0% Vermiculite		NONE DETECTED
		Color: Gray					
Analyzed By: Tarek Fata							
111	Attic	Attic Insulation	PLM	4% Cellulose 86% FiberGlass	10% Mineral Filler		
35685 -44					0.0% Vermiculite		NONE DETECTED
		Color: Gray					
Analyzed By: Tarek Fata							
112	1st Floor	Ceiling Paper	PLM		70% Mineral Filler		
35685 -45				30% Synthetic	0.0% Vermiculite		NONE DETECTED
		Color: Brown					
Analyzed By: Tarek Fata							
113	1st Floor	Ceiling Paper	PLM		60% Mineral Filler		
35685 -46				40% Synthetic	0.0% Vermiculite		NONE DETECTED
		Color: Brown					
Analyzed By: Tarek Fata							
114	Roof	Roof Tar	NOB-TEM			82.8% Organic 7.7% Residue 9.5% Carbonate	
35685 -47					0.0% Vermiculite		NONE DETECTED
		Color: Black					
Analyzed By: Tarek Fata		Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				



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Sample #	Location	Type of Material	Method	Non-Asbestos		NOB % Type	Asbestos % Type
				% Fibrous	% Non-Fibrous		
131	Roof	Wall Shingle Tar	NOB-PLM			45.6% Organic 16.7% Residue 32.2% Carbonate	5.5% Chrysotile
35685 -48					0.0% Vermiculite		
Analyzed By: Tarek Fata		Color: Black Second Analyst: Mohamed Fata	Comments: PLM inconclusive		Total Asbestos: 5.5 %		
135	Exterior	Window Glazing	NOB-TEM			12.7% Organic 4.4% Residue 82.9% Carbonate	NONE DETECTED
35685 -49					0.0% Vermiculite		
Analyzed By: Tarek Fata		Color: Brown Second Analyst: David Rivera	Comments: PLM inconclusive, NOB-PLM inconclusive				
137	Basement	Ceiling Plaster	PLM		100% Mineral Filler		
35685 -50					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
138	Basement	Ceiling Plaster	PLM		100% Mineral Filler		
35685 -51					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
139	Basement	Ceiling Plaster	PLM		100% Mineral Filler		
35685 -52					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Brown					
140	Basement	Ceiling Insulation	PLM	5% Cellulose 82% FiberGlass	13% Mineral Filler		
35685 -53					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Gray					
141	Basement	Ceiling Insulation	PLM	4% Cellulose 81% FiberGlass	15% Mineral Filler		
35685 -54					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Gray					
142	Basement	Ceiling Insulation	PLM	5% Cellulose 85% FiberGlass	10% Mineral Filler		
35685 -55					0.0% Vermiculite		NONE DETECTED
Analyzed By: Tarek Fata		Color: Gray					
143	Basement	Pipe Insulation	PLM	40% Cellulose	20% Mineral Filler		40% Chrysotile
35685 -56					0.0% Vermiculite		
Analyzed By: Tarek Fata		Color: Gray			Total Asbestos: 40 %		
144	Basement	Pipe Insulation					
35685 -57							NOT ANALYZED
Comments: Positive stop, see #143							



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Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u>	<u>Asbestos</u>
				% Fibrous	% Non-Fibrous	% Type	% Type
145	Basement	Pipe Insulation					
35685 -58							NOT ANALYZED
Comments: Positive stop, see #143							
146	Basement	Pipe Fitting Insulation	PLM		80% Mineral Filler		20% Chrysotile
35685 -59					0.0% Vermiculite		
Analyzed By: Tarek Fata		Color: Gray					Total Asbestos: 20 %
147	Basement	Pipe Fitting Insulation					
35685 -60							NOT ANALYZED
Comments: Positive stop, see #146							
148	Basement	Pipe Fitting Insulation					
35685 -61							NOT ANALYZED
Comments: Positive stop, see #146							



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Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u>	<u>Asbestos</u>
				% Fibrous	% Non-Fibrous	% Type	% Type

NOTES:

- 1) The Limit of Detection is the same as the Reporting Limit for these results.
- 2) The Reporting Limit (RL) is the Limit of Quantitation. For point counts the limit of quantitation of 0.25%; based on one asbestos point counter over 400 non-empty points.
- 3) Asbestos Containing Material (ACM) Definition: > 1% asbestos by weight is considered an ACM
- 4) Disclaimer: The laboratory is not responsible for sample collection. Please refer to enclosed letter. This report may not be reproduced, except in full, without written approval by ATC Group Services. This report may not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. This report relates only to the samples reported above as described in the chain of custody. Quality control data is available upon request.
- 5) Accredited by NVLAP #101187-0 and by NY State ELAP #10879
- 6) Confidentiality Notice: The document(s) contained herein are confidential and privileged information, intended for the exclusive use of the individual or entity named above.
- 7) Liability Notice: ATC Group Services and its personnel shall not be liable for any misinformation provided to us by the client regarding these samples. This report relates only to samples submitted and anal
- 8) Asbestos results are reliable to 2 significant figures.
- 9) The condition of all samples was acceptable upon receipt.
- 10) The laboratory certifies that the test results meet all requirements of NELAC.
- 11) Supplement to test report batch # _____, Amendments: ____, Amendment Dates: _____, Amended by: _____
- 12) PLM Letter is attached on this report.
- 13) TRACE: The result is reported as Trace when No points are counted and asbestos is identified. For ELAP Trace is < 1%.
- 14) ATC Group Services certifies that this report is an accurate and authentic report of the results obtained from the laboratory analysis
- 15) The uncertainty for these test results is available upon request.
- 16) ELAP requires method ELAP 198.1 for the analysis of samples containing \leq 10% vermiculite. For samples containing > 10% vermiculite ELAP requires methods ELAP 198.1 followed by ELAP 198.6. "This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."

Tarik Fata

Analyst:

Mohamed Fata

Analyst:

David Rivera

Analyst:

Mei Wang

Approved by

Quality Manager:



BULK ASBESTOS ANALYSIS RESULTS

PLM Analysis Methodology

The samples were analyzed by industry accepted methods in accordance with EPA and ELAP methods using Polarized Light Microscopy (PLM) with dispersion staining in conjunction with stereoscopical analysis. Point counts are performed on samples regulated by these agencies. The Environmental Laboratory Approval Program (ELAP) has determined that analysis of non-friable organically bound materials (i.e. floor tile, roofing, etc.) and ceiling tiles with cellulose is not reliable when performed by Polarized Light Microscopy (PLM) method. Therefore, if this analysis included that of non-friable materials or ceiling tiles with cellulose under PLM and the results were negative, ATC must add this disclaimer to maintain our ELAP accreditation:

"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 this material can be considered or treated as non-asbestos containing".

Non-friable samples that contained *Trace* or *No* PLM detectable asbestos are classified as Inconclusive. Samples that are layered and analyzed by the gravimetric method as composites (NESHAP, AHERA) should be considered positive if results are between trace and 1%, unless every layer is analyzed separately.

ELAP requires method ELAP 198.1 for the analysis of samples containing $\leq 10\%$ vermiculite with the exception of sprayed-on fireproofing containing vermiculite (SOF-V). For samples containing $>10\%$ vermiculite ELAP requires methods ELAP 198.1 followed by ELAP 198.6. This method has limitations for identification and quantification of vermiculite. "This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."

ELAP requires method ELAP 198.8 for the analysis of sprayed-on fireproofing containing vermiculite (SOF-V). Sample results for SOF-V tested by other methods upon client requests are inconclusive.

EPA does not regulate mixed mineral assemblage like the anthophyllite-talc intergrowth that is found in paint and caulking unless these materials contain asbestos in an amount greater than 1%. Anthophyllite detected in paint and caulking samples might be a talc intergrowth.

ATC has the capability of performing TEM confirmation if so desired.

Bulk sample reports are checked and reviewed two times. Unused portions of samples are archived for two months unless client requests special handling. This report must not be used by the client to claim product endorsement by NIST or any agency of the U.S. government.

ATC is not responsible for sample collection and analytical procedures not performed by our laboratory. This report may not be reproduced in part without the laboratory permission.

ATC will not be liable for analytical results from samples that are not prepared according to the standard methods (EPA, ELAP, etc.) used by the laboratory (e.g. composite samples from different locations, samples with insufficient volumes, straight TEM samples without gravimetric procedures, dust samples, non-friable samples by PLM only).

Laboratory Equipment

Laboratory analysis was accomplished utilizing Olympus BH-2 Microscopes.

Quality Control

ATC is accredited by NVLAP (Lab Code 101187-0) and NY State DOH ELAP (Lab ID 10879) for bulk and air fiber analyses. ATC participates in the Bulk Asbestos Sample Quality Assurance Programs for NVLAP and ELAP and maintains an in-house QC/QA program for bulk samples whereby 10% of all submitted samples are reanalyzed and documented in a Quality Control Manual. ATC also participates in a quarterly round robin QC/QA program for bulk samples with several accredited laboratories throughout the United States. Current and past QC/QA program results are available in the laboratory for inspection.

Accuracy and Precision

The phase abundances provided by point count may be considered within the limits of variability inherent in the method employed. For point counts the detection limit of 0.25% is based on one asbestos point counted over 400 non-empty points. If no points are counted and asbestos is identified, the result will be reported as trace. For ELAP trace is $< 1\%$.

The analyses were supervised by Milena Bonezzi, Director of Laboratory Services, who has extensive experience in asbestos analysis by PLM and other methods. Please contact me regarding any questions relating to these materials at 212-353-8280 Ext. 247.

1. EPA Methods: 600/M4-82-020
2. ELAP Method: 4088 Items 198.1 and 198.4 and 198.6 and 198.8

Sincerely,

Milena Bonezzi
ATC Group Services LLC
Director of Laboratory Services

Asbestos Bulk Sample Analysis - Chain of Custody

Client: LA POLICE (GREEN ARCHIVE)
 Site Location: 2610 AVALON RD. SYRACUSE, NY
 Project: ASBESTOS BULK SAMPLE ANALYSIS Date Sampled: 3-1-2016
 Technician: Francis Cinaco Cert#(s): 09-19591 Exp. 10/2016

DATA DELIVERY
 Phone: 914-232-7355
 Fax: 914-232-7357
 Email: admin@enviromain.com

Turn Around Time
 Rush 12hr 24hr 48hr 72hr
 Other: _____
 Lab#: _____

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
1	1	JOINT COMPOUND	3rd Floor	Y		Please Stop on First Positive for each Group Analyzed by TFAH 3/15/16 10208 W OCEY 3/16/16 56 P/W MZ
2	1	"				
3	2	OFFEETNOCK				
4	2	"				
5	3	PLASTER (BROWN)				
6	3	(WHITE)				
7	3	(BROWN)				
8	3	(WHITE)				
9	3	(BROWN)				
10	3	PLASTER (WHITE)				
11	4	BRICK COAT OVER				Drawing/Sketch (Required) Analyzed by TEM D. Rivera AL 3/16/16 0340AM
12	4	"				
13	4	PAVE COAT POLYURETHANE				
14	4	"				
15	4	"				
Sampled By: (Signature)		Date	Relinquished By: (Signature)		Date	3 NOB-Play 2 NOB-TEM
1) Printed Name: <u>Francis Cinaco</u>		Time	3) Printed Name:		Time	
Relinquished By: (Signature)		Date	4) Printed Name:		Time	
2) Printed Name:		Time	Title: <u>3/15/16</u>		Time: <u>1030</u>	

Asbestos Bulk Sample Analysis - Chain of Custody

Client: LA ROCCA GREEN BUILDING

Site Location: 210 AVALON RD. YONKERS NY

Project: LAPOV PINE HOUSE Date Sampled: 3-1-2016

Technician: Francis Ciraco Cert#(s): 09-19591 Exp: 10/2016

DATA DELIVERY

Phone: 914-232-7355

Fax: 914-232-7357

Email: admin@enviromain.com

Turn Around Time

Rush 12hr 24hr 48hr 72hr

Other: 48hr

Lab#:

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
1	5	Wall coverage	3rd floor	Y		Please Stop on First
2	1	concrete Asbestos		Y		Positive for each Group
3	6					
4	7	concrete (basement)				
5	8	"				
6	9	concrete (basement)				
7	10	"				
8	11	concrete (basement)				
9	12	"				
10	13	concrete (basement)				
11	14	"				
12	15	concrete (basement)				
13	16	"				
14	17	concrete (basement)				
15	18	"				
16	19	concrete (basement)				
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18	21	concrete (basement)				
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26	29	concrete (basement)				
27	30	"				
28	31	concrete (basement)				
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30	33	concrete (basement)				
31	34	"				
32	35	concrete (basement)				
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34	37	concrete (basement)				
35	38	"				
36	39	concrete (basement)				
37	40	"				
38	41	concrete (basement)				
39	42	"				
40	43	concrete (basement)				
41	44	"				
42	45	concrete (basement)				
43	46	"				
44	47	concrete (basement)				
45	48	"				
46	49	concrete (basement)				
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210	213	concrete (basement)				
211	214	"				
212	215	concrete (basement)				
213	216	"				
214	217	concrete (basement)				
215	218	"				
216</						



Environmental Maintenance Contractors, Inc.

5 Anderson Lane, Goldens Bridge, New York, 10526 Tel.: 914-232-7355, Fax: 914-232-7357

Page 3 of 10

Asbestos Bulk Sample Analysis - Chain of Custody

Client: LA ROCCA GREEN ARCHITECT

Site Location: 2610 ARAWAK RD. CHESTER, NY

Project: LASDON PARK HOUSE Date Sampled: 3-11-2016

Technician: Francis Ciriaci Cert#(s): 09-19591 Exp: 10/2016

DATA DELIVERY

Phone: 914-232-7355

Fax: 914-232-7357

Email: admin@enviromain.com

Turn Around Time

Rush 12hr 24hr 48hr 72hr

Other: _____

Lab#: _____

Field #	Group	Sample Description	Location	Frangible Y/N	Asbestos Content	Notes
31	13	9x9 VINYL TILE	3rd Floor	✓		Please Stop on First Positive for each Group TFC 3/15/16 1020 PM
32	13	BASE BOARD		✓		
33	13	BASE BOARD		✓		
34	13	"		✓		
35	15	SHUCCO		✓		
36	15	"		✓		
37	15	"	3rd Floor	✓		
38	3	PLASTER (BROWN)	2nd Floor	✓		
39	3	(WHITE)		✓		
40	3	(BROWN)		✓		
41	3	(WHITE)		✓	Drawing/Sketch (Required) Analyzed by TFC D. Rivera AR 3/16/16 0330 PM	
42	3	(BROWN)		✓		
43	3	PLASTER (WHITE)		✓		
44	3	PLASTER (WHITE)		✓		
45	3	PLASTER (WHITE)		✓		
Sampled By: (Signature)		Date	Relinquished By: (Signature)	Date		
1) Francis Ciriaci			3)			
Relinquished By: (Signature)		Date	Printed Name: Michael Ciriaci	Date: 3/15/16		
2) Printed Name:		Time	Printed Name: Michael Ciriaci	Time: 1030		

Asbestos Bulk Sample Analysis - Chain of Custody

Client: LA POCCA CONSULTING
 Site Location: 2610 ALPHEA RD. CORTAIC, NY
 Project: LABORATORY HOUSE Date Sampled: 3-1-2016
 Technician: Francis Ciriaco Cert#(s): 09-19591 Exp. 10/2016

DATA DELIVERY
 Phone: 914-232-7355
 Fax: 914-232-7357
 Email: admin@enviromain.com

Turn Around Time
 Rush 12hr 24hr 48hr 72hr
 Other: _____
 Lab#: _____

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
46	17	STUCCO	2nd Floor	Y		Please Stop on First Positive for each Group 3/15/16 1020 PM 3/16/16 0340 AM D. Rivera at Analyzed by J Ben
47	17	"				
48	17	"				
49	18	Wall Paper (Bust Sample)		Y		
50	18	"		Y		
51	19	Baseboard (corner)		Y		
52	19	"		Y		
53	19	Baseboard (corner)		Y		
54	19	"		Y		
55	19	Baseboard (corner)		Y		
56	19	"		Y		Drawing/Sketch (Required)
57	19	Baseboard (corner)		Y		
58	19	"		Y		
59	20	Cement wall not crust	2nd Floor	Y		
60	20	"		Y		

3/16/16 0340 AM
 D. Rivera at
 Analyzed by J Ben

Sampled By: (Signature) 1) <u>[Signature]</u>	Date	Relinquished By: (Signature) 3) <u>[Signature]</u>	Date
Printed Name: <u>Francis Ciriaco</u>	Time	Printed Name: <u>Michael</u>	Time
Relinquished By: (Signature) 2) <u>[Signature]</u>	Date	Relinquished By: (Signature) 4) <u>[Signature]</u>	Date
Printed Name: <u>Francis Ciriaco</u>	Time	Printed Name: <u>Michael</u>	Time

Asbestos Bulk Sample Analysis - Chain of Custody

Client: LA NOVA GREEN ARCHITECT
 Site Location: 2610 AVALON BLVD. A.P. JONES, NY
 Project: LABOR BULK HEAD Date Sampled: 3-1-2016
 Technician: Francis Ciraco Cert#(s): 09-19591 Exp: 10/2016
 Phone: 914-232-7355 Fax: 914-232-7357 Email: admin@enviromain.com
 Rush 12hr 24hr 48hr 72hr
 Other: Lab#:

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
61	28	Wall Paper (TAN)	2nd Floor	Y		Please Stop on First Positive for each Group ITL 3/15/16 1020PM
62	28	" "				
63	22	Wall Paper (WHITE FIBER)				
64	22	" "				
65	23	LINOCEUM MASTIC				
66	23	" "				
67	24	UNKNOWN FLOOR				
68	24	" "				
69	25	LINOCEUM (UNKNOWN)				
70	25	" "				
71	26	UNKNOWN FLOOR	2nd Floor			Drawing/Sketch (Required) Anubach, TEM D. Rivera AL 3/16/16 0340PM
72	26	" "				
73	27	UNKNOWN FLOOR				
74	27	" "				
75	28	LINOCEUM (UNKNOWN)				
Sampled By: (Signature)		Date		Relinquished By: (Signature)		Date
1)				3)		
Printed Name: Francis Ciraco		Time		Printed Name:		Time
Relinquished By: (Signature)		Date		Relinquished By: (Signature)		Date
2)				4)		
Printed Name:		Time		Printed Name:		Time
				Provided Name: [Signature] Office for Laboratory Use		Time

Drawing/Sketch (Required)

Analyzed by TBM
 D-Rivera AL
 3/16/16 03:45pm

ITL
 3/15/16
 10:20pm

Asbestos Bulk Sample Analysis - Chain of Custody

Client: LA ROCCA GREEN ARCHITECT
 Site Location: 2610 AVALON BLVD, PP. VERMONT, NY
 Project: CANOPY PARK HOUSE Date Sampled: 3-1-2016
 Technician: Francis Ciriaco Cert#(s): 09-19591 Exp: 10/2016

DATA DELIVERY
 Phone: 914-232-7355
 Fax: 914-232-7357
 Email: admin@enviromain.com

Turn Around Time
 Rush 12hr 24hr 48hr 72hr
 Other: _____
 Lab#: _____

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
74	2A	Structure (Basement)	Basement	N		Please Stop on First Positive for each Group <div style="text-align: right;"> <i>Flake</i> <u>3/15/16</u> <u>1020PM</u> </div>
75	2A	Floor tile/Glue (Area)				
76	2A	"				
77	2A	"				
78	2A	"				
79	2A	"				
80	2A	"				
81	2A	"				
82	2A	"				
83	2A	"				
84	2A	"				Drawing/Sketch (Required)
85	2A	"				
86	2A	"				
87	2A	"				
88	2A	"				
89	2A	"				
90	2A	"				
91	2A	"				
92	2A	"				
93	2A	"				
94	2A	"				Analyzing by TEM D. Rivera DL 3/16/16 03:00pm
95	2A	"				
96	2A	"				
97	2A	"				
98	2A	"				
99	2A	"				
100	2A	"				
101	2A	"				
102	2A	"				
103	2A	"				

Sampled By: (Signature) [Signature] Date _____

Relinquished By: (Signature) [Signature] Date _____

Date

Printed Name: Francis Ciriaco

Date

Time

Time

Time

Asbestos Bulk Sample Analysis - Chain of Custody

Client: LA POCCA CHESS ARCHITECT

Site Location: 2610 ALEXANDER RD. CONENAN, NY

Project: ADDITIONAL HOUSE Date Sampled: 3-1-2016

Technician: Francis Ciraco Cert#(s): 09-19591 Exp. 10/2016

DATA DELIVERY

Phone: 914-232-7355

Fax: 914-232-7357

Email: admin@enviromain.com

Turn Around Time

Rush 12hr 24hr 48hr 72hr

Other: 24hr

Lab#:

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
91	3	PLASTER (brown)	1ST FLOOR	Y		Please Stop on First Positive for each Group ITF 3/15/16 10:20 PM
92	3	(white)				
93	3	(brown)				
94	3	(white)				
95	3	(brown)				
96	3	PLASTER (white)		Y		
97	3	BASE COAT (brown)		Y		
98	3	"				
99	3	BASE COAT (brown)				
100	3	"				
101	3	BASE COAT (brown)				Drawing/Sketch (Required)
102	3	"				
103	3	BASE COAT (brown)				
104	3	"				
105	3	BASE COAT (brown)				
106	3	"				
107	3	BASE COAT (brown)				
108	3	"				
109	3	BASE COAT (brown)				
110	3	"				
111	3	BASE COAT (brown)				Analyzed by TEU D. Rivera Jr 3/16/16 03:46 AM
112	3	"				
113	3	BASE COAT (brown)				
114	3	"				
115	3	BASE COAT (brown)				
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131	3	BASE COAT (brown)				3/16/16 03:46 AM
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291	3	BASE COAT (brown)				3/16/16 03:46 AM
292	3	"				
293	3	BASE COAT (brown)				
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295	3	BASE COAT (brown)				
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297	3	BASE COAT (brown)				
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301	3	BASE COAT (brown)				3/16/16 03:46 AM
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321	3	BASE COAT (brown)				3/16/16 03:46 AM
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329	3	BASE COAT (brown)				
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331	3	BASE COAT (brown)				3/16/16 03:46 AM
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339	3	BASE COAT (brown)				
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341	3	BASE COAT (brown)				3/16/16 03:46 AM
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347	3	BASE COAT (brown)				
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349	3	BASE COAT (brown)				
350	3	"				
351	3	BASE COAT (brown)				3/16/16 03:46 AM
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353	3	BASE COAT (brown)				
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359	3	BASE COAT (brown)				
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361	3	BASE COAT (brown)				3/16/16 03:46 AM
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363	3	BASE COAT (brown)				
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367	3	BASE COAT (brown)				
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369	3	BASE COAT (brown)				
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371	3	BASE COAT (brown)				3/16/16 03:46 AM
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373	3	BASE COAT (brown)				
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375	3	BASE COAT (brown)				
376	3	"				
377	3	BASE COAT (brown)				
378	3	"				
379	3	BASE COAT (brown)				
380	3	"				
381	3	BASE COAT (brown)				3/16/16 03:46 AM
382	3	"				
383	3	BASE COAT (brown)				
384	3	"				
385	3	BASE COAT (brown)				
386	3	"				
387	3	BASE COAT (brown)				
388	3	"				
389	3	BASE COAT (brown)				
390	3	"				
391	3	BASE COAT (brown)				3/16/16 03:46 AM
392	3	"				
393	3	BASE COAT (brown)				
394	3	"				
395	3	BASE COAT (brown)				
396	3	"				
397	3	BASE COAT (brown)				
398	3	"				
399	3	BASE COAT (brown)				
4						

Asbestos Bulk Sample Analysis - Chain of Custody

Client: LA NOCIA STREET ARCHITECT
 Site Location: 2610 AREA WALK RD. NEWARK NJ
 Project: LA NOCIA PARK HOUSE DATE SAMPLED: 3-1-2016
 Technician: Francis Ciriaco Cert#(s): 09-19591 Exp. 10/2016

DATA DELIVERY
 Phone: 914-232-7355
 Fax: 914-232-7357
 Email: admin@enviromain.com

Test Around Time
 Rush 12hr 24hr 48hr 72hr
 Other:
 Lab#:

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
106	25	12' X 12' FLOOR TILE	NY FLOOR	↓		Please Stop on First Positive for each Group
107	25	12' X 12' FLOOR TILE	NY FLOOR	↓		
108	25	12' X 12' FLOOR TILE	NY FLOOR	↓		
109	41	ATTIC INSULATION	ATTIC	↓		
110	41	" "	↓			
111	41	" "	ATTIC	↓		Please Stop on First Positive for each Group
112	42	CEILING PAPER	1ST FLOOR	↓		
113	42	" "	" "	↓		
114	43	ROOF TAN	ROOF	↓		
115	43	" "	" "	↓		
116	43	ROOF FELT	ROOF	↓		Please Stop on First Positive for each Group
117	43	ROOF FELT	ROOF	↓		
118	43	ROOF FELT	ROOF	↓		
119	43	ROOF FELT	ROOF	↓		
120	43	ROOF FELT	ROOF	↓		
Sampled By: (Signature)		Date		Relinquished By: (Signature)		Date
1)				3)		
Printed Name: Francis Cirriaco		Time		Printed Name:		Time
Relinquished By: (Signature)		Date		Relinquished By: (Signature)		Date
2)				4)		
Printed Name:		Time		Printed Name:		Time
3/15/16		1230		3/15/16		1020AM
Drawing/Sketch (Required)						
Analyzed by JEM						
D. Rivera JR						
3/16/16 0340AM						

Sampled By: (Signature) [Signature] Date
 1) Printed Name: Francis Ciriaco Time
 Relinquished By: (Signature) [Signature] Date
 2) Printed Name: Time

Relinquished By: (Signature) [Signature] Date
 3) Printed Name: Time
 Relinquished By: (Signature) [Signature] Date
 4) Printed Name: Time

Date: 3/15/16
 Time: 1:55

Asbestos Bulk Sample Analysis - Chain of Custody

Client: LA BOCCA GREEN ARCHITECT

Site Location: 2610 AVALON BLVD. NEW YORK, NY 10024

Project: LA BOCCA GREEN ARCHITECT

Technician: Francis Ciriaco Cert#(s): 09-19591 Exp: 10/2016

DATA DELIVERY

Phone: 914-232-7355

Fax: 914-232-7357

Email: admin@enviromain.com

Turn Around Time

Rush 12hr 24hr 48hr 72hr

Other: 48hr

Lab#:

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
121	49	FRONT PORCH	FRONT PORCH			Please Stop on First Positive for each Group
122	49	"	"			
123	49	"	"			
124	49	"	"			
125	49	"	"			
126	49	"	"			Please Stop on First Positive for each Group
127	49	"	"			
128	49	"	"			
129	49	"	"			
130	49	"	"			
131	48	WALL SPACE	WALL SPACE			Please Stop on First Positive for each Group
132	48	"	"			
133	48	"	"			
134	48	"	"			
135	48	"	"			
136	50	WALL SPACE	WALL SPACE			Please Stop on First Positive for each Group
137	50	"	"			
138	50	"	"			
139	50	"	"			
140	50	"	"			

Drawing/Sketch (Required)

Analysis by TEM

D. Rivera

3/16/16 03:00pm

1) Sampled By: (Signature)

Printed Name: Francis Ciriaco

Date

Relinquished By: (Signature)

Printed Name:

Date

2) Relinquished By: (Signature)

Date

Printed Name:

Time

Printed Name:

Time

03:00



Environmental Maintenance Contractors, Inc.

5 Anderson Lane, Goldens Bridge, New York, 10526 Tel.: 914-232-7355, Fax: 914-232-7357

Page 10 of 10

Asbestos Bulk Sample Analysis - Chain of Custody

Client: LA BOCCA ENTERPRISES

Site Location: 2610 AVALON RD. SOMERSET, NY

Project: ASBESTOS BULK ANALYSIS Date Sampled: 3-1-2016

Technician: Francis Ciriaci Cert#(s): 09-19591 Exp. 10/2016

DATA DELIVERY

Phone: 914-232-7355

Fax: 914-232-7357

Email: admin@envfromain.com

Turn Around Time

Rush 12hr ☐ 24hr ☒ 48hr ☒ 72hr ☐

Other: ☐

Lab#:

Field #	Group	Sample Description	Location	Frangible Y/N	Asbestos Content	Notes
136	51	CERAMIC PLASTER	BASEMENT	Y		Please Stop on First Positive for each Group TEJ 3/11/16 10:20 PM
137	51	"	"			
138	51	"	"			
139	51	"	"			
140	52	CERAMIC INSULATION	"			
141	52	"	"			Drawing/Sketch (Required) Analyzed by TEJ D. Rivera DL 3/16/16 03:40 PM
142	52	"	"			
143	53	PIPE INSULATION	"			
144	53	"	"			
145	53	"	"			
146	54	PIPE FITTING INSULATION	"			
147	54	"	"			
148	54	"	"			

Sampled By: (Signature)		Relinquished By: (Signature)	
1)		3)	
Printed Name:	Francis Ciriaci	Printed Name:	Michael C. Ciriaci
Relinquished By: (Signature)		Date	3/15/16
Printed Name:	Michael C. Ciriaci	Date	3/15/16



ATC Group Services LLC

104 E. 25th Street, 10th Floor

New York, NY 10010

Tel. 212-353-8280

Fax: 212-353-8306

Client: ENVIRONMENTAL MAINTENANCE CONTRACTORS

5 ANDERSON LANE

GOLDENS BRIDGE, NY 10526

Fax: (914) 232-7357

Phone: (914) 232-7355

Project: LA ROCCA GREEN ARCHITECT

Sample Date: 5/26/2016

Date Received: 5/27/2016

Date Analyzed: 5/30/2016

ATC Batch # 36637

Methods: EPA 600/M4-82-020

ELAP 198.1, 198.6 and 198.4

Location: 2610 AMAWALK ROAD, SOMERS, NY

Bulk Asbestos Analysis Results

Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u>	<u>Asbestos</u>
				% Fibrous	% Non-Fibrous	% Type	% Type
1	FLAT ROOF	ROOF FELT BENEATH COPPER METAL	NOB-TEM			80.8% Organic 11.3% Residue 7.9% Carbonate	NONE DETECTED
36637 -1					0.0% Vermiculite		
Analyzed By: Mei Wang		Color: BLACK Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
2	FLAT ROOF	ROOF FELT BENEATH COPPER METAL	NOB-TEM			70.3% Organic 26.3% Residue 3.4% Carbonate	NONE DETECTED
36637 -2					0.0% Vermiculite		
Analyzed By: Mei Wang		Color: BLACK Second Analyst: Mark Peysakhov	Comments: PLM inconclusive, NOB-PLM inconclusive				
3	FLAT ROOF PERIMETER	ROOF BOARD	PLM	95% Cellulose	5% Mineral Filler		
36637 -3					0.0% Vermiculite		NONE DETECTED
Analyzed By: Mei Wang		Color: BROWN					
4	FLAT ROOF PERIMETER	ROOF BOARD	PLM	95% Cellulose	5% Mineral Filler		
36637 -4					0.0% Vermiculite		NONE DETECTED
Analyzed By: Mei Wang		Color: BROWN					
5	SLOPE SHINGLE ROOF	ROOF INSULATION	PLM		5% Mineral Filler		
36637 -5				95% FiberGlass	0.0% Vermiculite		NONE DETECTED
Analyzed By: Mei Wang		Color: OFF-WHITE					
6	SLOPE SHINGLE ROOF	ROOF INSULATION	PLM		5% Mineral Filler		
36637 -6				95% FiberGlass	0.0% Vermiculite		NONE DETECTED
Analyzed By: Mei Wang		Color: OFF-WHITE					
7	SLOPE SHINGLE ROOF	ROOF INSULATION	PLM		5% Mineral Filler		
36637 -7				95% FiberGlass	0.0% Vermiculite		NONE DETECTED
Analyzed By: Mei Wang		Color: OFF-WHITE					



ATC Group Services LLC

104 E. 25th Street, 10th Floor

New York, NY 10010

Tel. 212-353-8280

Fax: 212-353-8306

Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u>	<u>Asbestos</u>
				% Fibrous	% Non-Fibrous	% Type	% Type
8	SLOPE SHINGLE ROOF	ROOF INSULATION	PLM		5% Mineral Filler		
36637 -8				95% FiberGlass	0.0% Vermiculite		NONE DETECTED
			Color: OFF-WHITE				
Analyzed By: Mei Wang							
9	SLOPE SHINGLE ROOF	ROOF BOARD	PLM	95% Cellulose	5% Mineral Filler		
36637 -9					0.0% Vermiculite		NONE DETECTED
			Color: LT.BROWN				
Analyzed By: Mei Wang							
10	SLOPE SHINGLE ROOF	ROOF BOARD	PLM	95% Cellulose	5% Mineral Filler		
36637 -10					0.0% Vermiculite		NONE DETECTED
			Color: LT.BROWN				
Analyzed By: Mei Wang							



ATC Group Services LLC

104 E. 25th Street, 10th Floor

New York, NY 10010

Tel. 212-353-8280

Fax: 212-353-8306

Sample #	Location	Type of Material	Method	<u>Non-Asbestos</u>		<u>NOB</u>	<u>Asbestos</u>
				% Fibrous	% Non-Fibrous	% Type	% Type

NOTES:

- 1) The Limit of Detection is the same as the Reporting Limit for these results.
- 2) The Reporting Limit (RL) is the Limit of Quantitation. For point counts the limit of quantitation of 0.25%; based on one asbestos point counter over 400 non-empty points.
- 3) Asbestos Containing Material (ACM) Definition: > 1% asbestos by weight is considered an ACM
- 4) Disclaimer: The laboratory is not responsible for sample collection. Please refer to enclosed letter. This report may not be reproduced, except in full, without written approval by ATC Group Services. This report may not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. This report relates only to the samples reported above as described in the chain of custody. Quality control data is available upon request.
- 5) Accredited by NVLAP #101187-0 and by NY State ELAP #10879
- 6) Confidentiality Notice: The document(s) contained herein are confidential and privileged information, intended for the exclusive use of the individual or entity named above.
- 7) Liability Notice: ATC Group Services and its personnel shall not be liable for any misinformation provided to us by the client regarding these samples. This report relates only to samples submitted and anal
- 8) Asbestos results are reliable to 2 significant figures.
- 9) The condition of all samples was acceptable upon receipt.
- 10) The laboratory certifies that the test results meet all requirements of NELAC.
- 11) Supplement to test report batch # _____. Amendments: _____. Amendment Dates: _____. Amended by: _____
- 12) PLM Letter is attached on this report.
- 13) TRACE: The result is reported as Trace when No points are counted and asbestos is identified. For ELAP Trace is < 1%.
- 14) ATC Group Services certifies that this report is an accurate and authentic report of the results obtained from the laboratory analysis
- 15) The uncertainty for these test results is available upon request.
- 16) ELAP requires method ELAP 198.1 for the analysis of samples containing ≤ 10% vermiculite. For samples containing > 10% vermiculite ELAP requires methods ELAP 198.1 followed by ELAP 198.6. "This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."

Mei Wang

Analyst:

Mohamed Fata

Analyst:

Aleks Barengolts

Analyst:

Mei Wang

Approved by
Quality Manager:



BULK ASBESTOS ANALYSIS RESULTS

PLM Analysis Methodology

The samples were analyzed by industry accepted methods in accordance with EPA and ELAP methods using Polarized Light Microscopy (PLM) with dispersion staining in conjunction with stereoscopical analysis. Point counts are performed on samples regulated by these agencies. The Environmental Laboratory Approval Program (ELAP) has determined that analysis of non-friable organically bound materials (i.e. floor tile, roofing, etc.) and ceiling tiles with cellulose is not reliable when performed by Polarized Light Microscopy (PLM) method. Therefore, if this analysis included that of non-friable materials or ceiling tiles with cellulose under PLM and the results were negative, ATC must add this disclaimer to maintain our ELAP accreditation:

"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 this material can be considered or treated as non-asbestos containing".

Non-friable samples that contained *Trace* or *No* PLM detectable asbestos are classified as Inconclusive. Samples that are layered and analyzed by the gravimetric method as composites (NESHAP, AHERA) should be considered positive if results are between trace and 1%, unless every layer is analyzed separately.

ELAP requires method ELAP 198.1 for the analysis of samples containing $\leq 10\%$ vermiculite with the exception of surfacing material containing vermiculite (SM-V). For samples containing $>10\%$ vermiculite ELAP requires methods ELAP 198.1 followed by ELAP 198.6. This method has limitations for identification and quantification of vermiculite. "This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."

ELAP requires method ELAP 198.8 for the analysis of surfacing material containing vermiculite (SM-V). Sample results for SM-V tested by other methods upon client requests are inconclusive.

EPA does not regulate mixed mineral assemblage like the anthophyllite-talc intergrowth that is found in paint and caulking unless these materials contain asbestos in an amount greater than 1%. Anthophyllite detected in paint and caulking samples might be a talc intergrowth.

ATC has the capability of performing TEM confirmation if so desired.

Bulk sample reports are checked and reviewed two times. Unused portions of samples are archived for two months unless client requests special handling. This report must not be used by the client to claim product endorsement by NIST or any agency of the U.S. government.

ATC is not responsible for sample collection and analytical procedures not performed by our laboratory. This report may not be reproduced in part without the laboratory permission.

ATC will not be liable for analytical results from samples that are not prepared according to the standard methods (EPA, ELAP, etc.) used by the laboratory (e.g. composite samples from different locations, samples with insufficient volumes, straight TEM samples without gravimetric procedures, dust samples, non-friable samples by PLM only).

Laboratory Equipment

Laboratory analysis was accomplished utilizing Olympus BH-2 Microscopes.

Quality Control

ATC is accredited by NVLAP (Lab Code 101187-0) and NY State DOH ELAP (Lab ID 10879) for bulk and air fiber analyses. ATC participates in the Bulk Asbestos Sample Quality Assurance Programs for NVLAP and ELAP and maintains an in-house QC/QA program for bulk samples whereby 10% of all submitted samples are reanalyzed and documented in a Quality Control Manual. ATC also participates in a quarterly round robin QC/QA program for bulk samples with several accredited laboratories throughout the United States. Current and past QC/QA program results are available in the laboratory for inspection.

Accuracy and Precision

The phase abundances provided by point count may be considered within the limits of variability inherent in the method employed. For point counts the detection limit of 0.25% is based on one asbestos point counted over 400 non-empty points. If no points are counted and asbestos is identified, the result will be reported as trace. For ELAP trace is $< 1\%$.

The analyses were supervised by Milena Bonezzi, Director of Laboratory Services, who has extensive experience in asbestos analysis by PLM and other methods. Please contact me regarding any questions relating to these materials at 212-353-8280 Ext. 247.

1. EPA Methods: 600/M4-82-020
2. ELAP Method: 4088 Items 198.1 and 198.4 and 198.6 and 198.8

Sincerely,

Milena Bonezzi
ATC Group Services LLC
Director of Laboratory Services

Asbestos Bulk Sample Analysis - Chain of Custody

Client: LA ROCCA GREEN ARCHITECT
 Site Location: 2610 AMARAL ROAD SPAINIA, NY
 Project: Date Sampled: 5/26/2016
 Technician: FLOYD SUS Cert#(s): 06-00928 Exp: 6/16

DATA DELIVERY
 Phone: 914-232-7355
 Fax: 914-232-7357
 Email: admin@enviromain.com



Turn Around Time
 Rush 12hr 24hr 48hr 72hr
 Other: 24hr
 Lab#:

Field #	Group	Sample Description	Location	Friable Y/N	Asbestos Content	Notes
1	1	ROOF FELT BECAUSE COPPER METAL	FLAT ROOF	N		Please Stop on First Positive for each Group 2 NOB Plus 2 NOB TEU
2	1	" " " "		N		
3	2	ROOF BOARD	PERIMETER	Y		
4	2	" " "	FLAT ROOF			
5	3	ROOF INSULATION	SLOPE SHINGLE ROOF			
6	3	" " "				
7	3	" " "				
8	3	" " "				
9	4	ROOF BOARD				
10	4	" " "	SLOPE SHINGLE ROOF	Y		
Drawing/Sketch (Required)						
<p>Sampled By: (Signature) <u>[Signature]</u> Date <u>5/26/16</u></p> <p>Printed Name: _____ Time _____</p> <p>Relinquished By: (Signature) <u>[Signature]</u> Date _____</p> <p>Printed Name: _____ Time _____</p> <p>Received By: (Signature) <u>[Signature]</u> Date <u>5/27/16</u></p> <p>Printed Name: <u>E. Velez</u> Time <u>9:30am</u></p> <p>For Laboratory Use</p>						

analyzed by mms
 5/27/16

LOPLIN
 5/30/16
 8:40 AM

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE




FLOYD E SUS
CLASS(EXPIRES)
C ATEC(06/16) D INSP(06/16)
H PM (06/16)

CERT# 06-00928
DMV# 236686372

MUST BE CARRIED ON ASBESTOS PROJECTS

NYC DEP ASBESTOS CONTROL PROGRAM
ASBESTOS CERTIFICATE



**SUS,
FLOYD
INVESTIGATOR
128410**

EXPIRES: 6/1/2017
DOB:6/1/1983 M 5' 02"

MUST BE CARRIED ON ALL ASBESTOS PROJECTS

New York State – Department of Labor

Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Environmental Maintenance Contractors, Inc.

5 Anderson Lane

Goldens Bridge, NY 10526

FILE NUMBER: 05-0348

LICENSE NUMBER: 28535

LICENSE CLASS: FULL

DATE OF ISSUE: 05/13/2016

EXPIRATION DATE: 05/31/2017

Duly Authorized Representative – Richard Stumbo:

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

SECTION 033053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes for north driveway wall, ramp, floor slab and stair replacement for Alternate Three and for equipment pads.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.

1.4 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. Comply with the following sections of ACI 301 unless modified by requirements in the Contract Documents:
 - 1. "General Requirements."
 - 2. "Formwork and Formwork Accessories."
 - 3. "Reinforcement and Reinforcement Supports."
 - 4. "Concrete Mixtures."
 - 5. "Handling, Placing, and Constructing."
 - 6. "Normalweight Concrete."
- B. Comply with ACI 117.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 1064/A as drawn.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A plain, fabricated from as-drawn steel wire into flat sheets.

2.3 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I
- C. Normal-Weight Aggregate: ASTM C 33/C 33M, 1-1/2-inch nominal maximum aggregate size.
- D. Air-Entraining Admixture: ASTM C 260/C
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- F. Water: ASTM C 94

2.4 RELATED MATERIALS

- A. Vapor Retarder: Plastic sheet, ASTM E 1745, Class A or B.
- B. Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils
- C. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.6 CONCRETE MIXTURES

- A. Comply with ACI 301.
- B. Normal-Weight Concrete:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.50
 - 3. Slump Limit: 4 inches plus or minus 1 inch
 - 4. Air Content: Maintain within range permitted by ACI 301 Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116, and furnish batch ticket information.
 - 1. When air temperature is above 90 deg F
 - 2. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 3. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 4. For mixer capacity larger than 1 cu. yd.
 - 5. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR-RETARDER INSTALLATION

- A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended adhesive or joint tape.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.

- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Consolidate concrete with mechanical vibrating equipment according to ACI 301
- E. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases 6 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: 4000 psi at 28 days.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor them into structural concrete substrate.
 - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.7 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
 - 1. Do not further disturb surfaces before starting finishing operations.
- C. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 (ACI 301M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. , but less than 25 cu. yd. , plus one set for each additional 50 cu. yd. or fraction thereof.

END OF SECTION 033053

SECTION 040120.64 - BRICK AND STONE MASONRY CONSTRUCTION AND REPOINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Replacement exterior site walls and stairs at North Driveway for Alternate Three
2. Repointing brick and stone joints of building, site walls and terrace paving with mortar.
3. Repointing joints with sealant.

1.3 ALLOWANCES – NOT USED

1.4 UNIT PRICES – NOT USED

1.5 DEFINITIONS – NOT USED

1.6 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 1. Review methods and procedures related to repointing brick and stone masonry including, but not limited to, the following:
 - a. Verify masonry specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Quality-control program.
 - d. Coordination with building occupants.

1.7 SEQUENCING

- A. Work Sequence: Perform masonry repointing work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry.
5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
6. Repair masonry, including replacing existing masonry with new masonry materials.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

1.8 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

1. Dimensioned plans, sections, elevations and details showing new work coordinated with concrete work. Include plans, elevations, sections, and locations of repointing work on the structure.
2. Show provisions for expansion joints or other sealant joints.
3. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.

1.9 INFORMATIONAL SUBMITTALS

A. Qualification Data: For masonry repointing specialist.

B. Quality-control program.

1.10 QUALITY ASSURANCE

A. Masonry Repointing Specialist Qualifications: Engage an experienced masonry repointing firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing masonry is insufficient experience for masonry repointing work.

1. Field Supervision: masonry repointing specialist firms shall maintain experienced full-time supervisors on Project site during times that brick masonry repointing work is in progress.

- B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage.
- C. Mockups: Prepare mockups of masonry repointing to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Repointing: Rake out joints in two separate areas, each approximately 24 inches high by 36 inches wide for each type of repointing required, and repoint one of the areas.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.11 PRECONSTRUCTION TESTING – NOT USED

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.13 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Temperature Limits, General: Repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.
- C. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:
 - 1. When air temperature is below 40 deg F , heat mortar ingredients and existing masonry walls to produce temperatures between 40 and 120 deg F

2. When mean daily air temperature is below 40 deg F (4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after pointing.
- D. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain each type of material for repointing masonry (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Masonry Cement: ASTM C 91/C 91M.
- D. Mortar Cement: ASTM C 1329/C 1329M.
- E. Mortar Sand: ASTM C 144.
 1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
 2. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
- F. Water: Potable.

2.3 BRICK AND BLUESTONE STAIR REPLACEMENT

- A. Match existing brick and bluestone stair treads. Clean and reuse existing if feasible.

2.4 ACCESSORY MATERIALS

- A. Sealant Materials:
 1. Sealant manufacturer's standard elastomeric sealant(s) of base polymer and characteristics indicated below and according to applicable requirements in

Section 079200 "Joint Sealants." Retain and coordinate type(s) of joint sealant required in "Type" Subparagraph below with applicable subparagraph titles used in Section 079200 "Joint Sealants" in which various sealant types are specified. Revise sealant type to suit Project.

2.5 MORTAR MIXES

- A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
- B. Do not use admixtures in mortar unless otherwise indicated.
- C. Mixes: Mix mortar materials in the following proportions:
 - 1. Pointing Mortar by Type: ASTM C 270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to masonry cement or mortar cement.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Prevent mortar from staining face of surrounding masonry and other surfaces.
 - 1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
 - 2. Keep wall area wet below pointing work to discourage mortar from adhering.
 - 3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

3.2 MASONRY REPOINTING, GENERAL

- A. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 50 feet away by Architect.

3.3 REPOINTING MASONRY

- A. Rake out and repoint joints as shown on Drawings:
- B. Rake out joints as follows, according to procedures demonstrated in approved mockup:
 - 1. Remove mortar from joints to depth of joint width plus 2 times joint width 2-1/2 times joint width or not less than that required to expose sound, unweathered mortar. Do not remove unsound mortar more than 2 inches deep; consult Architect for direction.
 - 2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
 - 3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.

- C. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- D. Pointing with Mortar:
 - 1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
 - 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer, and allow it to become thumbprint hard before applying next layer.
 - 3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
 - 4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
 - 5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 - 6. Hairline cracking within mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.
- E. Pointing with Sealant: Comply with Section 079200 "Joint Sealants." and as follows:
 - 1. After raking out, keep joints dry and free of mortar and debris.
 - 2. Clean and prepare joint surfaces. Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
 - 3. Fill sealant joints with specified joint sealant.
 - a. Install cylindrical sealant backing beneath the sealant. Where space is insufficient for cylindrical sealant backing, install bond-breaker tape.
 - b. Install sealant using only proven installation techniques that ensure that sealant is deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding masonry and matching the contour of adjoining mortar joints.
 - c. Install sealant as recommended in writing by sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:
 - 1) Fill joints to a depth equal to joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.
 - d. Tool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant from surfaces adjacent to joint.

3.4 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water applied by low-pressure spray.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.
- B. Clean adjacent nonmasonry surfaces. Use detergent and soft brushes or cloths.
- C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- D. Remove masking materials, leaving no residues that could trap dirt.

3.5 FIELD QUALITY CONTROL

- A. Owner's Project Representatives: Owner will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Owner's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.
- B. Notify Owner's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Owner's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION 040120.64

SECTION 044313.13 - ANCHORED STONE MASONRY VENEER

1.1 SUMMARY

A. Section Includes:

1. Stone masonry anchored to concrete backup at North Driveway Wall.

B. Products Installed but Not Furnished under This Section Include:

1. Steel lintels in unit masonry.
2. Section 040120 Brick and stone masonry repointing

1.2 ACTION SUBMITTALS

A. Product Data: For stone accessories, mortar

B. Samples: Field stone to match existing or cleaned existing stone to be reused.

1.3 FIELD CONDITIONS

A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.

B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried.

C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.0 STONE

A. Local "field stone" to match existing or existing stone cleaned.

PART 3 - MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Masonry Cement: ASTM C 91/C 91M.
- D. Aggregate: ASTM C 144 and as follows:
 - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.
 - 2. White Aggregates: Natural white sand or ground white stone.
- E. Water: Potable.

3.2 VENEER ANCHORS

- A. Materials:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 1064/A 1064M; with ASTM A 153/A 153M, Class B-2.
- B. Size: Sufficient to extend at least halfway, but not less than 1-1/2 inches, through stone masonry and with at least a 5/8-inch cover on exterior face.
- C. Wire Veneer Anchors: Wire ties formed from W1.7 or 0.148-inch- diameter, hot-dip galvanized-steel wire.
- D. Corrugated-Metal Veneer Anchors: Not less than 0.060-inch- thick by 7/8-inch- wide hot-dip galvanize-steel sheet with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch
 - 1. .
 - 2. Fabricate wire connector sections from 0.187-inch diameter, hot-dip galvanized-steel wire.

3.3 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

3.4 FABRICATION

- A. Select stone to produce pieces of thickness, size, and shape indicated, including details on Drawings and pattern specified in "Setting Stone Masonry" Article.
 - 1. Shape stone specified to be laid in three-course, random range ashlar pattern with split beds.
- B. Thickness of Stone: Provide thickness indicated.
- C. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples.
 - 1. Finish for Copings: match existing

3.5 MORTAR MIXES

- A. General: Do not use admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride.
 - 2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
 - 3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Mortar for Stone Masonry: Comply with ASTM C 270, Proportion Specification.
 - 1. Mortar for Setting Stone: Type S
 - 2. Mortar for Pointing Stone: Type N

PART 4 - EXECUTION

4.1 PREPARATION

- A. Accurately mark stud centerlines on face of weather-resistant sheathing paper before beginning stone installation.
- B. Coat concrete backup with asphalt dampproofing.

4.2 SETTING STONE MASONRY

- A. Perform necessary field cutting and trimming as stone is set.
 - 1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.

2. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.
 3. Pitch face at field-split edges as needed to match stones that are not field split.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange stones to match existing random pattern and sizes.

4.3 INSTALLATION OF ANCHORED STONE MASONRY

- A. Anchor stone masonry to concrete with corrugated-metal veneer anchors unless otherwise indicated. Secure anchors by inserting dovetailed ends into dovetail slots in concrete.
- B. Anchor stone masonry to unit masonry with corrugated-metal veneer anchors unless otherwise indicated. Embed anchors in unit masonry mortar joints or grouted cells at a distance of at least one-half of unit masonry thickness.
- C. Space anchors to provide not less than one anchor per 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings, sealant joints, and perimeter at intervals not exceeding 12 inches.
- D. Set stone in full bed of mortar with full head joints unless otherwise indicated. Build anchors into mortar joints as stone is set.
- E. Rake out joints for pointing with mortar to depth of not less than 3/4 inch before setting mortar has hardened.

4.4 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.
- B. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
1. Joint Profile: Match existing

4.5 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
5. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20, Revised II, using job-mixed detergent solution.

4.6 EXCESS MATERIALS AND WASTE

- A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.

END OF SECTION 044313.13

SECTION 055313 - BAR GRATINGS AND MISCELLANEOUS METALS

1.1 SUMMARY

- A. Section includes metal bar gratings and metal frames and supports for gratings at Pump House

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Clips and anchorage devices for gratings.
 - 2. Galvanizing
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For gratings, including manufacturers' published load tables

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Gratings shall withstand the effects of gravity loads of the full water tanks. Contractor shall prove Structural Engineer calculations and sizing.
- B. Seismic Performance: Gratings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7

1.4 METAL BAR GRATINGS

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 531 "Metal Bar Grating Manual and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual "
 - 1. Bearing Bar Spacing: 1-7/8 inches
 - 2. Bearing Bar Depth As required to comply with structural performance requirements
 - 3. Bearing Bar Thickness: As required to comply with structural performance requirements
 - 4. Crossbar Spacing: 4 inches o.c.
 - 5. Traffic Surface: Knurled
 - 6. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. of coated surface

1.5 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Bars for Bar Gratings: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- C. Wire Rod for Bar Grating Crossbars: ASTM A 510 steel, Grade 30 with G90 (Z275) coating.

1.6 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1.7 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

1.8 FABRICATION

- A. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- B. Fit exposed connections accurately together to form hairline joints.

1.9 STEEL FINISHES

- A. Finish gratings, frames, and supports after assembly.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

PART 2 - EXECUTION

2.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- B. Fit exposed connections accurately together to form hairline joints.
 - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Attach toeplates to gratings by welding at locations indicated.

- D. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

2.2 INSTALLING METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

2.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055313

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Rooftop equipment bases and support curbs.
 - 3. Wood blocking, cants, and nailers.
 - 4. Wood furring and grounds.
 - 5. Wood sleepers.
 - 6. Utility shelving.
 - 7. Plywood backing panels.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Sustainable Design Submittals:

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS – NOT USED

2.4 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions: Construction or No. 2 Standard, Stud, or No. 3 grade of any of the following species:
 1. Hem-fir (north); NLGA.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Furring.
 6. Grounds.
 7. Utility shelving.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
 1. Hem-fir (north); NLGA.

- C. Utility Shelving: Lumber with 19 percent maximum moisture content of any of the following species and grades:
 - 1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. Concealed Boards: 19 percent maximum moisture content of the following species and grades:
- E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or Type 304 stainless steel
 - 2. Nails, Brads, and Staples: ASTM F 1667.
- B. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2

2.8 METAL FRAMING ANCHORS – NOT USED

2.9 MISCELLANEOUS MATERIALS – NOT USED

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal
 - 3. sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
- H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

- I. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Gypsum Board or Plaster Lath: Install 1-by-2-inch nominal- size furring vertically at 16 inches o.c.

3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

- B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Exterior wood cellular PVC trim.
 - 2. Lumber Plywood Hardboard siding.
 - 3. Exterior trim at replacement doors and windows

- B. Related Requirements:

- 1. Section 061053 "Miscellaneous Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
 - 2. Section 062020 "Exterior PVC Railings"
 - 3. Section 099113 "Exterior Painting" for priming and backpriming of exterior finish carpentry.
 - 4. Section 074624 "Wood Shakes and Shingles"
 - 5. Section 06419 Exterior Wood Shutters
 - 6. Section 081433 Stile and Rail Wood Doors
 - 7. Section 085200 Wood Windows

1.3 DEFINITIONS

- A. MDO: Plywood with a medium-density overlay on the face.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

- 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.
- C. Samples for Verification:
 1. For each species and cut of lumber and panel products, with half of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.
 2. For hardboard siding, 50 sq. in. for board types and 8 by 10 inches for panels.
 3. For cellular PVC trim, with half of exposed surface finished; 50 sq. in.
 4. For foam plastic moldings, with half of exposed surface finished; 50 sq. in.
 5. For exterior wood columns, include quarter-section Samples of cap, base, plinth, and 6-inch- long Sample of shaft.

1.5 INFORMATIONAL SUBMITTALS

- A. Compliance Certificates:
 1. For lumber that is not marked with grade stamp.
 2. For preservative-treated wood that is not marked with treatment-quality mark.
 3. For fire-retardant-treated wood that is not marked with classification marking of testing and inspecting agency.
- B. Evaluation Reports: For the following, from ICC-ES:
 1. Wood-preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Cellular PVC trim.
 4. Foam plastic moldings.
- C. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE – NOT USED

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
 - 1. For exterior ornamental wood columns, comply with manufacturer's written instructions and warranty requirements.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1.9 WARRANTY

- A. Manufacturer's Warranty for Cellular PVC Trim: Manufacturer agrees to repair or replace trim that fails due to defects in manufacturing within specified warranty period. Failures include, but are not limited to, deterioration, delamination, and excessive swelling from moisture.
 - 1. Warranty Period: 25 from date of Substantial Completion.
- B. Manufacturer's Warranty for Hardboard Siding: Manufacturer agrees to repair or replace siding that fails in materials or workmanship within specified warranty period. Failures include, but are not limited to, deformation or deterioration beyond normal weathering.
 - 1. Warranty Period for Factory-Applied Finish: Five years from date of Substantial Completion.
 - 2. Warranty Period for Siding (Excluding Finish): 10 years from date of Substantial Completion.
- C. Manufacturer's Warranty for Columns: Manufacturer agrees to repair or replace columns that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Columns: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated.
- B. Factory mark each piece of lumber with grade stamp of inspection agency, indicating grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber, mark grade stamp on end or back of each piece.
- C. Softwood Plywood: DOC PS 1.
- D. Hardboard: ANSI A135.4.

- E. PVC trim and Column Covers: Intex Millwork, Millville NJ.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Water-Repellent Preservative Treatment by Nonpressure Process: AWP A N1; dip, spray, flood, or vacuum-pressure treatment.
 - 1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC)
 - 2. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
- B. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC3a.
 - 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
 - 2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
 - 4. Do not use material that is warped or does not comply with requirements for untreated material.
 - 5. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.
 - 6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
 - a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Application: Where indicated

2.4 EXTERIOR TRIM

- A. Lumber Trim for Opaque-Stained Painted Finish:
 - 1. Species and Grade: Eastern white pine, eastern hemlock-balsam fir-tamarack, eastern spruce, or white woods, D Select (Quality).
 - 2. Maximum Moisture Content: 19 percent with at least 85 percent of shipment at 12 percent or less.
 - 3. Face Surface: Surfaced (smooth).
 - 4. Factory Priming: Factory coated on faces and edges, with exterior primer compatible with topcoats specified.

- B. Moldings for Painted Finish: MMPA WM 4, P-grade wood moldings. Made from kiln-dried stock to patterns included in MMPA's "WM/Series Wood Moulding Patterns."
 - 1. Brick-Mold Pattern: WWMPA WM 180, 1-1/4 by 2 inches
 - 2. Drip-Cap Pattern: WWMPA WM 197, 11/16 by 1-5/8 inches
 - 3. Bed-Mold Pattern: WWMPA WM 75, 9/16 by 1-5/8 inches
 - 4. Screen-Bead Pattern: WWMPA WM 144, 1/4 by 3/4 inch
- C. MDO Trim: Exterior Grade B-B MDO plywood.
- D. Primed Hardboard Trim: ANSI A135.6, primed with manufacturer's standard exterior primer. Recommended by manufacturer for exterior use.
- E. Cellular PVC Trim and Column Wraps: Manufacturer-Intex millwork, Extruded, expanded PVC with a small-cell microstructure, recommended by manufacturer for exterior use, made from UV- and heat-stabilized rigid material.
 - 1. Density: Not less than 31 lb/cu. ft. (500 kg/cu. m).
 - 2. Heat Deflection Temperature: Not less than 130 deg F (54 deg C), according to ASTM D 648.
 - 3. Coefficient of Thermal Expansion: Not more than 4.5×10^{-5} inches/inch x deg F (8.1×10^{-5} mm/mm x deg C).
 - 4. Water Absorption: Not more than 1 percent, according to ASTM D 570.
 - 5. Flame-Spread Index: 75 or less, according to ASTM E 84.
- F. Foam Plastic Moldings: Molded product of shapes indicated, recommended by manufacturer for exterior use, with a tough outer skin on exposed surfaces; factory primed. Exposed surfaces shall not be shaped after molding.
 - 1. Density: Not less than 20 lb/cu. ft. (320 kg/cu. m).
 - 2. Flame-Spread Index: Not more than 75 when tested according to ASTM E 84.
 - 3. Thickness: Not more than 1/2 inch (12.7 mm).
 - 4. Width: Not more than 8 inches (204 mm).
 - 5. Patterns: Match Existing.

2.5 LUMBER SIDING – NOT USED

2.6 PLYWOOD SIDING – NOT USED

2.7 HARDBOARD SIDING – NOT USED

2.8 LUMBER SOFFITS

- A. Provide kiln-dried lumber siding complying with DOC PS 20, factory coated with exterior primer compatible with topcoats specified.
- B. Species and Grade: D Select Quality eastern white pine, eastern hemlock-balsam fir-tamarack, eastern spruce, or white woods; NeLMA, NLGA, WCLIB, or WWPA.

- C. Pattern: V-edge, smooth-faced tongue and groove, actual face width (coverage) and thickness of 3-1/8 by 9/16 23/32 inch

2.9 PLYWOOD SOFFITS

- A. Plywood Type: Exterior, Grade A-C
 - 1. Face Grade: 303-OC
- B. Thickness: 19/32 inch
- C. Face Species: Southern pine
- D. Pattern: Plain. Texture 1-11; grooves 4 inches o.c.
- E. Surface: Smooth

2.10 HARDBOARD SOFFITS – NOT USED

2.11 EXTERIOR STAIRS AND RAILINGS – See section 062020.

2.12 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.
 - 1. For face-fastening siding, provide ringed-shank siding nails or hot-dip galvanized-steel siding nails unless otherwise indicated.
 - 2. For prefinished items, provide matching prefinished aluminum fasteners where face fastening is required.
 - 3. For pressure-preservative-treated wood, provide hot-dip galvanized-steel fasteners.
 - 4. For applications not otherwise indicated, provide hot-dip galvanized-steel or aluminum fasteners.
 - 5. Horizontal Joint Flashing for Panel Siding: Preformed, prefinished-aluminum, Z-shaped flashing.
- B. Continuous Soffit Vents: Aluminum hat channel shape with stamped louvers
- C. Round Soffit Vents: Stamped aluminum louvered vents, 3 inches made to be inserted into round holes cut into soffit.
 - 1. Finish: White paint.
- D. Round Soffit Vents: Molded-plastic louvered vents 4 inches in diameter, made to be inserted into round holes cut into soffit.

- E. Sealants: Latex, complying with ASTM C 834 and applicable requirements in Section 079200 "Joint Sealants" and recommended by sealant and substrate manufacturers for intended application.

2.13 FABRICATION

- A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends. Comply with requirements in Section 099113 "Exterior Painting."

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.

2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install flat-grain lumber with bark side exposed to weather.
- B. Install cellular PVC trim to comply with manufacturer's written instructions.
- C. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary.
 1. Use scarf joints for end-to-end joints.
 2. Stagger end joints in adjacent and related members.
- D. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints, with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
- E. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 SIDING INSTALLATION

- A. Plywood Siding: Install panels with edges over framing or blocking. Nail at 6 inches o.c. at panel perimeter and 12 inch o.c. at intermediate supports unless manufacturer recommends closer spacing. Leave 1/16-inch gap between adjacent panels and 1/8-inch gap at perimeter, openings, and horizontal joints unless otherwise recommended by panel manufacturer.
 1. Seal butt joints at inside and outside corners and at trim locations.
 2. Install continuous metal flashing at horizontal panel joints.
 3. Apply battens and corner trim as indicated. Countersink nail heads, fill flush, and sand filler.
- B. Flashing: Install metal flashing as indicated on Drawings and as recommended by siding manufacturer.
- C. Finish: Apply finish within two weeks of installation.

3.6 STAIR AND RAILING INSTALLATION – NOT USED

3.7 ORNAMENTAL COLUMN INSTALLATION – NOT USED

3.8 ADJUSTING

- A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.9 CLEANING

- A. Clean exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.10 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062013

SECTION 062020 – EXTERIOR PVC RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and other Contract Documents, listed in the agreement between the Owner and Contractor, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior PVC railings.
 - 2. Finishing of PVC railings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, and colors and include construction and application details.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.
- D. Delegated-Design Submittal: For railing systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ATI:
 - 1. CCRR-0155.
- B. Warranties: Provide sample warranties.

1.5 QUALITY ASSURANCE

- A. Engineer PVC Railing System to meet design loads indicated in CCRR report.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials flat with spacers between bundles to provide air circulation. Protect materials with waterproof covering.
- B. Do not store packaging materials in direct sunlight to prevent heat buildup.

1.7 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed.
- B. Do not install PVC materials that are damaged.

1.8 WARRANTY

- A. Manufacturer's Warranty for Cellular PVC Railings Systems: Manufacturer agrees to replace components that fails due to defects in manufacturing within specified warranty period.
 - 1. Warranty Period: Limited Lifetime Warranty. Refer to manufacturer's website for details.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. INTEX Millwork Solutions, LLC; 20 Bogden Blvd., Millville, NJ 08332; Tel: (856) 293-4100, Fax: (856) 293-4102.

2.2 HAMPTON EXTRUDED RAIL SYSTEM

- A. Cellular PVC: Extruded, expanded PVC with a small-cell microstructure, recommended by manufacturer for exterior use, made from UV- and heat-stabilized, rigid material.
 - 1. Basis of Design Product: Subject to compliance with requirements, provide the following: Intex Millwork Solutions; Hampton Extruded Rail System.
- B. Rail Section Length: Match existing.
- C. Rail Section Height: 42 inches.
- D. Top Rail: Model RS40350F (Flat cap top rail) 1/2 inch high by 3-1/2 inch wide extruded rigid cellular PVC contoured rail profile.
- E. Top Rail Base: 1-1/2 inch high by 2-15/16 inch wide extruded rigid cellular PVC contoured rail profile.
- F. Bottom Rail: 1-1/2 inch high by 2-15/16 inch wide extruded rigid cellular PVC contoured rail profile.
- G. Aluminum Reinforcing Insert: 6063-T5 extruded aluminum "C" section. Used in top and bottom rail of all systems.
- H. Balusters: Model # RS40BAL 1-1/4 inch square extruded rigid cellular PVC pickets and custom "Panel" for rooftop railing as shown on drawings..
- I. Newel Post Cover: Model # RS40NP548 Standard 5 by 5 inches by 48 inches.
- J. Newel Caps and Trim: NICP6 Island Cap Pyramidal
- K. Support Block: 1-1/4 in square extruded rigid cellular PVC picket cut to length and secured to

The underside of the bottom rail.

- L. Rail to Post Connection: Manufacturer's standard.

2.2 MISCELLANEOUS MATERIALS

- A. Fasteners for PVC Railing Components: All fasteners should be 18-8 Stainless Steel. Fasteners are provided by the manufacturer with each railing kit.
- B. Adhesive for Cellular PVC:
 - 1. Extreme Adhesives; PVC Trim Welder.
 - 2. Christy's Red Hot White Vinyl Adhesive.
- C. Sealants: Type as recommended by manufacturer and complying with ASTM C 834 and with applicable requirements in Division 07 Section "Joint Sealants."

2.3 FINISHING

- A. If railings will be painted, INTEX recommends the use of premium grade acrylic paints with Solar reflective pigment. Use paints designed for use with PVC products.
- B. Colors: Due to the inherent expansion and contraction characteristics of PVC, INTEX PVC Millwork products should only be painted using colors with an LVR (light reflective value) greater than 55. Use of darker colors may cause damage due to excessive expansion/contraction, and will void the product warranty.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine PVC materials before installation. Reject materials that are damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound or warped.
 - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Scribe and cut PVC components to fit adjoining work.
2. Coordinate PVC components with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 INSTALLATION - GENERAL

- A. Install PVC railing systems in strict accordance with manufacturer's written installation instructions, and detailed shop drawings.
- B. Refer to manufacturer's website for latest information and installation videos.

3.5 ADJUSTING

- A. Replace PVC components that are damaged or does not comply with requirements. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean exposed and semi exposed PVC surfaces.

3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace PVC materials that are damaged.

END OF SECTION 062020

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 097720 Decorative Fiberglass reinforced Wall Panels

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior trim, including interior door frames and windows.
 - 2. Fire-rated interior door frames.
 - 3. Shelving.
 - 4. Radiator enclosures at windows
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
 - 2. Section 099123 "Interior Painting" for priming and backpriming of interior finish carpentry.
 - 3. Section 81433 Stile and Rail Wood Doors
 - 4. Section 85200 Wood Windows

1.3 DEFINITIONS

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.

- B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.
- C. Samples for Verification:
 - 1. For each species and cut of lumber and panel products with nonfactory-applied finish, with half of exposed surface finished, 50 sq. in. for lumber and 8 by 10 inches for panels.
 - 2. For foam plastic moldings, with half of exposed surface finished; 50 sq. in.
 - 3. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8 by 10 inches for panels.
 - 4. For interior wood columns, include quarter-section

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For fire-retardant-treated wood, from ICC-ES.
- B. Sample Warranty: For manufacturer's warranty.

1.6 QUALITY ASSURANCE – NOT USED

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.9 WARRANTY – NOT USED

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's Board of Review. Grade lumber by an agency certified by the American Lumber Standard Committee's Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece
- B. Softwood Plywood: DOC PS 1.
- C. Hardboard: ANSI A135.4.
- D. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
 - 1. Color: White

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category [UC1] [UC2].
 - 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
 - 2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium
 - 3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
 - 4. Do not use material that is warped or does not comply with requirements for untreated material.
 - 5. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: For applications indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and comply with testing requirements; testing will be conducted by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
- C. Do not use material that does not comply with requirements for untreated material or is warped or discolored.
- D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Application: Where indicated.

2.4 INTERIOR TRIM

- A. Softwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
 - 1. Species and Grade: Eastern white pine, D Select; NeLMA or NLGA.
 - 2. Species and Grade: Idaho white, lodgepole, ponderosa, radiata, or sugar pine, C Select 1 Common (Colonial); NLGA or WWP.
 - 3. Species and Grade: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine, D Select (Quality) Finish or 1 Common (Colonial); NeLMA, NLGA, or WWP.
 - 4. Species and Grade: White woods, C Select WWP.
 - 5. Species and Grade: Douglas fir-larch or Douglas fir south, Superior finish; NLGA, WCLIB, or WWP.
 - 6. Species and Grade: Southern pine, B & B finish; SPIB.
 - 7. Species and Grade: Western red cedar, Grade A; NLGA, WCLIB, or WWP.
 - 8. Maximum Moisture Content: 19 percent
 - 9. Finger Jointing: Not allowed.
 - 10. Face Surface: Surface smooth.
- B. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
 - 1. Species and Grade: Red oak ,Clear; NHLA.
 - 2. Maximum Moisture Content: 13 percent.
 - 3. Finger Jointing: Not allowed.
 - 4. Gluing for Width: Not allowed.
 - 5. Veneered Material: Not allowed.
 - 6. Face Surface: Surfaced (smooth).
 - 7. Matching: Selected for compatible grain and color.

- C. Lumber Trim for Opaque Finish (Painted Finish):
1. Species and Grade: Eastern white pine, D Select; NeLMA or NLGA.
 2. Species and Grade: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine, D Select (Quality); NeLMA, NLGA, or WWPA.
 3. Maximum Moisture Content: 19 percent[
 4. Maximum Moisture Content" Subparagraph below is for hardwood boards. NHLA does not define any maximum moisture content values for kiln-dried hardwood lumber; purchaser must specify the value. Values in subparagraph are based on ranges given for optimum moisture content in AWI's "Architectural Woodwork Quality Standards Illustrated." First option applies to damp coastal areas of the southern United States and the Maritime Provinces. Second option applies to Ontario, Quebec, and most of the United States. Third option applies to the dry southwestern United States and to Alberta, Manitoba, and Saskatchewan.
 5. Maximum Moisture Content: 13 percent.
 6. Finger Jointing: Not allowed.
 7. Face Surface: Surfaced (smooth).
- D. Softwood Moldings for Transparent Finish (Stain or Clear Finish): MMPA WM 4, N-grade wood moldings. Made to patterns included in MMPA's "WM/Series Wood Moulding Patterns."
1. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
 2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
 3. Finger Jointing: Not allowed.
 4. Matching: Selected for compatible grain and color.
 5. Shapes and Patterns shall match existing
- E. Moldings for Opaque Finish (Painted Finish): Made to patterns included in MMPA's "WM/Series Wood Molding Patterns."
1. Softwood Moldings: MMPA WM 4, P grade.
 - a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine
 - b. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
 2. Hardwood Moldings: MMPA HWM 4, P-grade.
 - a. Species: Aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar.
 - b. Maximum Moisture Content: 9 percent.
 3. Finger Jointing: Not allowed
 4. Shapes and patterns to match existing
- F. PVC-Wrapped Moldings: MMPA WM 2 and made to patterns included in MMPA's "WM/Series Wood Moulding Patterns."
1. Shapes and Patterns to match existing

- G. Foam Plastic Moldings: Molded product of shapes indicated, with a tough outer skin on exposed surfaces; factory primed. Exposed surfaces shall not be shaped after molding.
1. Density: Not less than 20 lb/cu. ft. .
 2. Flame-Spread Index: Not more than **75** when tested according to ASTM E 84.
 3. Thickness: Not more than 1/2 inch.
 4. Width: Not more than 8 inches
 5. Patterns: As indicated by manufacturer's designations.

2.5 PANELING

- A. Board Paneling: Interior wood-board paneling complying with MMPA WM 9.
1. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
 2. Grade: Knotty No. 1.
 3. Maximum Moisture Content: 15 percent
 4. Retain one of four options in "Pattern" Subparagraph below or revise to suit Project. See MMPA WM 9.
 5. Pattern: V-joint, tongue and groove, PT 82.
 6. Net Coverage Width: Not less than 8-3/4 inches .
- B. Board Paneling:
1. Species and Grade: Idaho white, lodgepole, ponderosa, radiata, or sugar pine, D Select (Quality) 1 Common Colonial NLGA or WWPA.
 2. Maximum Moisture Content: 19 Pattern: V-joint, tongue and groove, Sizes in "Net Coverage Width" Subparagraph below represent 6-, 8-, and 10-inch nominal widths.
 3. Net Coverage Width: Not less than 8-3/4 inches

2.6 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Low-Emitting Materials: Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Installation Adhesive for Foam Plastic Moldings: Product recommended for indicated use by foam plastic molding manufacturer.
- D. Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.
- E. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

2.7 FABRICATION

- A. Back out or kerf backs of the following members, except those with ends exposed in finished work:
 - 1. Interior standing and running trim, except shoe and crown molds.
 - 2. Wood-board paneling.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 3. Install to tolerance of 1/8 inch in 96 inches) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - 2. Install trim after gypsum-board joint finishing operations are completed.
 - 3. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 PANELING INSTALLATION

- A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings. Install with uniform tight joints between panels.
 - 1. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners and adhesive as recommended by panel manufacturer.
 - 2. Conceal fasteners to greatest practical extent.
 - 3. Arrange panels with grooves and joints over supports. Fasten to supports with nails of type and at spacing recommended by panel manufacturer. Use fasteners with prefinished heads matching groove color.
- B. Board Paneling: Install according to manufacturer's written instructions. Arrange in random-width pattern suggested by manufacturer unless boards or planks are of uniform width.
 - 1. Install in full lengths without end joints.
 - 2. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards. Install with uniform tight joints between boards.
 - 3. Fasten paneling by blind nailing through tongues.

3.6 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.8 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062023

SECTION 064919 - EXTERIOR WOOD SHUTTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior shutters.
 - 2. Shop priming exterior shutters.
 - 3. Shop finishing exterior shutters.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product and process indicated and incorporated into exterior wood shutters during fabrication, finishing, and installation.
 - 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 3. Include copies of warranties from chemical-treatment manufacturers for each type of treatment.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Apply AWI Quality Certification Program label to Shop Drawings.
- C. Samples for Verification:
 - 1. Lumber for shop-applied opaque finish, 5 inches (125 mm) wide by 12 inches (300 mm) long for each finish system and color, with one-half of exposed surface finished.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of product.

- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- D. Evaluation Reports: For wood-preservative-treated wood from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

1.6 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation of exterior wood shutters only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.
- B. Field Measurements: Verify dimensions of related construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 FABRICATORS

2.2 EXTERIOR SHUTTERS, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.3 EXTERIOR SHUTTERS FOR OPAQUE FINISH

- A. Manufacturer: Southern Shutter Company, Montgomery, Alabama
- B. Description: "Design Line" 1 3/8" Thick Stile and Rail, Premium Grade, panel design to match existing.
- C. Wood Species: Ponderosa pine or sugar pine.

2.4 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
 - 2. Wood Moisture Content: 9 to 15 percent.
- B. Water-Repellent Preservative Treated Materials: Comply with AWPAC N1 (dip, spray, flood, or vacuum-pressure treatment).
 - 1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC), combined with an insecticide containing chlorpyrifos (CPF).
 - 2. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
 - 3. Extent of Water-Repellent Preservative Treatment: Treat all shutters.

2.5 INSTALLATION MATERIALS

- A. Nails: hot-dip galvanized.
- B. Screws: hot-dip galvanized.
 - 1. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.
- C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip-galvanized anchors and inserts unless otherwise indicated. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.6 FABRICATION

- A. Sand wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate shutters to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- C. Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

2.7 SHOP PRIMING

- A. Wood Shutters for Opaque Finish: Shop prime wood shutters for paint finish with one coat of wood primer specified in Section 099113 "Exterior Painting."

- B. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of shutters. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

2.8 SHOP FINISHING

- A. Grade: Custom.
- B. General: Entire finish of exterior wood shutters is specified in this Section. To greatest extent possible, finish wood shutters at fabrication shop. Defer only final touchup and cleaning until after installation.
- C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing wood shutters, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of wood shutters. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.
- D. Woodwork for Opaque Finish: Finish wood shutters to comply with Section 099113 "Exterior Painting."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition wood shutters to average prevailing humidity conditions in installation areas.
- B. Before installing wood shutters, examine shop-fabricated work for completion and complete work as required, including backpriming.

3.2 INSTALLATION

- A. Quality Standard: Install wood shutters to comply with same grade as item to be installed.
- B. Install wood shutters true and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches
- C. Scribe and cut wood shutters to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

- D. Complete finishing work specified in this Section to extent not completed at shop or before installation of wood shutters. Fill nail and screw holes with matching filler where exposed.
- E. Refer to Section 099113 "Exterior Painting" for final finishing of installed wood shutters.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective wood shutters, where possible, to eliminate functional and visual defects; replace wood shutters where not possible to repair. Adjust joinery for uniform appearance.
- B. Clean wood shutters on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064919

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Cold-applied, emulsified-asphalt dampproofing on foundation wall areaway infills.

- B. Related Requirements:

- 1. Section 042000 "Unit Masonry" for mortar parge coat on masonry surfaces.

1.3 ACTION SUBMITTALS

- A. Product Data and manufacturer's application instructions for each type of product.

1.4 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide protection course and auxiliary materials recommended in writing by manufacturer of primary materials.
- B. Dampproofing: Karnak Corporation, Clark, NJ 07066. Chemrex, Sonneborn Div., Shakopee, MN 55379
- C. Protection Board: W.R. Meadows, Hampshire, IL 60140, Henry Company, Huntington Park, CA 90255

2.2 PERFORMANCE REQUIREMENTS

- A. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

2.3 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Primer

1. Primer for solvent-based material shall be asbestos free and conform to ASTM D41.

2. Product

- a) Karnak 108
- b) Sonnenborn Sonoshield 648 Mastic

B. Volatile Solvent-based Dampproofing

1. Brush or Spray Application:

- a. Asbestos free, solvent based, asphalt compound with fibers conforming to ASTM D4479 Type I.
- b. Product
 - 1) Karnak No. 83-AF Fibrated Dampproofing.
 - 2) Sonnenborn Sonoshield Semi-mastic and 128 Spray Mastic

2. Trowel Mastic application:

- a. Heavy bodied, asbestos free, solvent-based, asphalt compound material conforming to ASTM D4586 Type I.
- b. Product
 - 1) Karnak No. 86-AF Fibrated Trowel Mastic.
 - 2) Sonnenborn Sonoshield Mastic

C. Protection Board

1. Formed from inert material such as asphalt-treated fiberboard that will not react with dampproofing material meeting ASTM D6506, Class A, Type 2. Board shall be asbestos free.
2. Product
 - a. W.R. Meadows Sealtight Protection Course, PC-2.
 - b. Henry Asphalt Protection Course

2.4 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Patching Compound: latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for surface smoothness, maximum surface moisture content, and other conditions affecting performance of the Work.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for dampproofing application.
- B. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- C. Clean substrates of projections and substances detrimental to dampproofing work; fill voids, seal joints, and remove bond breakers if any.
- D. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise 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.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Foundation Walls: Apply primer and two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat primer and one fibered brush or spray coat at not less than 3 gal./100 sq. ft. or primer and one trowel coat at not less than 5 gal./100 sq. ft.

3.5 PROTECTION COURSE INSTALLATION

- A. Install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
 - 1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
 - 2. Install protection course within 24 hours of dampproofing installation (while coating is tacky) to ensure adhesion.

END OF SECTION 071113

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket.
 - 2. Glass-fiber board.
 - 3. Loose-fill insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Foil Faced: ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

2.2 GLASS-FIBER BOARD

- A. Glass-Fiber Board, Faced: ASTM C 612, Type IA; faced on one side with foil-scrim-kraft or foil-scrim-polyethylene vapor retarder, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84. Nominal density of 2.25 lb/cu. ft. , thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.3 LOOSE-FILL INSULATION

- A. Cellulosic-Fiber Loose-Fill Insulation: ASTM C 739, chemically treated for flame-resistance, processing, and handling characteristics.

2.4 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

2.5 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
 - 2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.

- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
 - 2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
 - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
 - 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 - 5. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:

- a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
6. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward interior of construction.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 1. Glass-Fiber 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.
- C. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
 1. For cellulosic-fiber loose-fill insulation, comply with CIMA's Bulletin #2, "Standard Practice for Installing Cellulose Insulation."

3.5 INSTALLATION OF REFLECTIVE INSULATION

- A. Install sheet reflective insulation according to ASTM C 727.
- B. Install sheet radiant barriers according to ASTM C 1744.
- C. Install interior radiation control coating system according to ASTM C 1321.

3.6 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

1.2 SUMMARY

- A. The Work of this Section includes all plant, labor, materials, equipment, testing and services necessary to complete the work shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Remove all existing sloped roofing material, including underlayments and flashings.
 - a. The work may include removing asbestos containing roofing materials. Refer to the asbestos abatement specification for additional information and asbestos removal requirements.
2. Coordinate and install new ice & water shield, underlayment, asphalt shingles, asphalt cement, fasteners, sealants, flashings, other similar items to provide a watertight installation

- B. Related Requirements

1. Brick & Stone Masonry Repointing - Section 040120.64
2. Miscellaneous Rough Carpentry - Section 061053
3. Exterior PVC Railings - Section 062020
4. Thermal Insulation -Section 072100
5. SBS Modified Bitumen Roofing - Section 075216
6. Sheet Metal Flashing & Specialties - Section 076200

1.3 CODE APPROVAL

- A. Install asphalt shingle components to meet the following minimum requirements:
 1. New York State Uniform Fire Prevention and Building Code.
 2. Underwriters Laboratories Inc. Class A External Fire Rating for Roof Covering Materials.
 3. Underwriters Laboratories Inc. 110 mph Wind Rating for Roof Covering Materials.

1.4 QUALITY ASSURANCE

- A. General: Do not apply ice & water shield, underlayment or shingles when the substrate is wet.
- B. Installer Qualifications:
 1. A firm (Installer) with not less than 5 continuous years experience performing asphalt shingle work similar to that required for this project, employing personnel skilled in the work specified.

2. The Installer shall provide a reference list of at least three projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner:
 - a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number.
 - b. The Installer shall provide the reference list prior to contract award if requested.
3. The Installer shall directly employ the personnel performing the work of this section.
4. The Installer shall have a full time supervisor on the roof when roofing work is in progress. The Supervisor shall have a minimum of 5 years experience in roofing work similar in nature and scope to this project, and speak fluent English.
 - a. The Installer shall provide the Supervisor's resume prior to contract award if requested.
- C. Material Quality: Obtain each product, including the ice & water shield, underlayment, nails and shingles, from a single Manufacturer which has manufactured the same product in the United States of America for not less than 5 continuous years.
- D. Pre-Work Conference: Meet at the project site approximately one week prior to starting work, with the Architect, Owner and other representatives concerned about the work, to discuss the following:
 1. How the building will be kept watertight as old roofing is removed and the work progresses.
 2. How the installation of asphalt shingles will be coordinated with the installation of attic insulation, ice & water shield, underlayment, flashings and other items to provide a watertight installation.
 3. Generally accepted industry practice, the Manufacturer's instructions for handling and installing his products, and specified work requirements.
 4. The condition of the deck substrate, curbs, penetrations and other preparatory work needed.
 5. Submittals, both completed and yet to be completed.
 6. The construction schedule, forecast weather, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
 7. A schedule for Manufacturer and Architect inspections.

1.5 SUBMITTALS

- A. Submit the following items far enough in advance to obtain approval prior to performing any work:
 - 1. Pre-work site and building inspection report with photos to document conditions before work starts.
 - 2. Manufacturer's technical literature for all components of the asphalt shingle roof, including the fasteners.
 - 3. Test reports and certifications to show the materials submitted comply with the specification requirements if requested by the Owner or Architect.
 - 4. Six full size shingle samples.
 - 5. A sample of the Manufacturer's Warranty and Contractor's Guarantee forms.
 - 6. Simultaneously provide all technical submittals needed for this project, for all technical sections, collated by section.
 - a. Technical submittals shall be prepared and made by the firm that will perform the actual work.
- B. Safety Data Sheets: Provide all Material Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders for each building.
- C. Payment requisitions will not be processed until all submittals are received and approved.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver material to the site in the Manufacturer's original and unopened packaging, bearing labels which identify the type and names of the products and Manufacturers, with Underwriters' Laboratories, Inc. labels intact and legible.
 - 1. Store material on raised platforms and cover it immediately upon delivery.
 - 2. Keep material dry until installed.
 - 3. Do not stack bundles of shingles more than 4 feet high.
 - 4. Store rolled goods on end.
 - 5. Do not overload the structure when storing materials on the roof.

1.7 GUARANTEE

- A. Provide the standard Manufacturer's 30 year "Lifetime" limited warranty against manufacturing defects.
- B. Provide a Contractor's written Guarantee which warrants that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion:
 - 1. Defective work includes but is not limited to the following types of failure: leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, and undue expansion.

2. The Contractor's Guarantee shall provide that the Contractor will make the repairs and modifications necessary to enable the work to perform as warranted at his own expense.
 3. The Guarantee shall include the removal and replacement of items or materials installed as part of the original work, if removal is needed to affect guaranteed repairs.
- C. Provide one Contractor's Guarantee that covers "all work performed" when a single contractor is awarded work specified in multiple Sections.
- D. The Contractor's Guarantee shall be issued no more than 30 days before the satisfactory completion of punch list work.
- E. The Contractor's Surety Company may add a rider to the Performance Bond which clarifies that Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor's Guarantee.

PART 2 - PRODUCTS

2.1 ASPHALT SHINGLES

- A. Asphalt Shingles shall comply with the following standards and characteristics:
1. ASTM Specification D-3462.
 2. U.L. Class A External Fire Rating.
 3. U.L. Wind Resistant Rating.
 4. Approximate Size: 36 inches long x 12 inches wide, 5 inch exposure.
 5. Color as selected.
- B. Shingles shall be 40 year laminated fiberglass architectural textured shingles as manufactured by Tamko: Heritage XL or approved equal.
- C. Utilize manufacturer's special hip and ridge shingles.

2.2 ACCESSORY MATERIALS

- A. Ice and Water Shield:
1. Standard - 40 mil thick slip resistant, rubberized asphalt adhesive sheet, backed with a layer of cross laminated polyethylene, with a release paper for peel and stick application directly to the prepared roof deck: W.R. Grace Ice & Water Shield.
 2. High Temperature - 30 mil thick slip resistant, rubberized asphalt adhesive sheet, backed with a layer of cross laminated polyethylene, with a release paper for peel and stick application directly to a prepared substrate: Grace Ultra Ice & Water Shield.
 3. Use high temperature ice & water shield where it is in contract with sheet metal flashings.
- B. Underlayment: 12 mil thick spun-bonded polypropylene coated with UV stabilized polyolefin: WR Grace Tri-Flex 30.
- C. Asphalt Cement: Type 1, asbestos-free grade bituminous plastic cement complying with Federal Specification of SS-C-153B.

D. Fasteners:

1. Felt - galvanized or aluminum cap nails with low profile heads.
2. Shingles - Hot dipped, 12 gauge barbed shank, galvanized roofing nails, long enough to penetrate through the underside of the sheathing about 1/4 inch.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove all existing sloped roofing materials, including underlayments, protruding nails, bituminous mastic, caulking, and other materials.
- B. Repair and refasten the roof deck, to assure that all surfaces are restored to a condition which will properly support the new underlayment and shingles.
- C. Replace deteriorated portions of roof decking in accordance with the Unit Price /Cost Bid.
- D. Maintain the buildings watertight in the interim, but do not install shingles until deck defects are corrected.
- E. Do not apply any new material over wet surfaces.

3.2 ICE AND WATER SHIELD

- A. Install a 12 inch wide strip of ice & water shield on the roof eaves before the metal drip edge is installed.
- B. Install ice & water shield, fully adhered to the deck surface and metal drip edge to shed water at all roof eaves, extending from the eave up the slope 6 feet, and at least 2 feet past the inside face of the building wall.
- C. Install ice & water shield over the entire surface of dormers and crickets, around penetrations, and on each side of metal valleys. Turn the ice shield up 6 inches at intersecting vertical walls, chimneys, and parapets.
- D. Overlap ice & water shield plies 3 inches and end laps 6 inches, minimum.
- E. Store ice & water shield between 60°F and 80°F when the outside temperature is 40°F or below; install the ice & water shield immediately after removing it from storage to assure it adheres to the substrate, and quickly install fasteners for the shingles and flashings through the ice and water shield - to assure self-sealing nail performance.

3.3 UNDERLAYMENT

- A. Install underlayment over the entire roof surface above the ice & water shield, and over the ice & water shield when needed to achieve a UL Class A External Fire rating..
- B. Lap underlayment plies 3 inches toward the eaves and 6 inches at the ends.
- C. Fasten the underlayment with cap nails spaced 12 inches on center along the ply lines and end laps, and in all directions through-out the sheet.

- D. Lap underlayment at least 12 inches to form double thickness at ridges, and hips.

3.4 ASPHALT SHINGLES

- A. Install asphalt shingles in accordance with the requirements and recommendations of the Manufacturer, except as modified herein.
- B. Utilize chalk lines and install the shingles with straight courses and uniform exposure. Do not exceed the Manufacturer's recommended course exposure.
- C. Nail each strip of asphalt shingles with a minimum of 4 nails. Leave no exposed nails in the completed installation.
- D. Fit shingles neatly around pipes, ventilators and other projections in roof, but do not cover the bottom flanges of pipe and apron flashings.
- E. Utilize the manufacturer's special hip and ridge shingles.
- F. Form open valleys, which taper, increasing in size from the top to bottom.
- G. Do not puncture sheet metal flashings with nails, as the shingles are installed.

3.5 CLEANING, PROTECTION AND WATERTIGHTNESS

- A. Inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any work.
- B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leakage or damage which was not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.
- C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.
- D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.
- E. Frequently clean up all refuse, rubbish, scrap materials and debris so the work site presents a neat, orderly and workmanlike appearance.
- F. Carefully clean the roof to remove all residual debris when work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris or shingle granules, to enter the drainage system.

END OF SECTION 073113

SECTION 074624 - WOOD SHINGLE AND SHAKE SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood-shake siding.
- B. Related Requirements:
 - 1. Section 062013 "Exterior Finish Carpentry" for wood exterior-wall trim.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
- C. Samples: For each exposed product and for each color and finish specified, in sizes indicated.
 - 1. Wood Shakes: Full size unit.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wood Shakes: 100 sq. ft. of each type, color, and finish, in unbroken bundles.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store siding in a dry, well-ventilated, weathertight location according to manufacturer's written instructions.
- B. Store rolls of felt used for weather-resistive barrier on end, on pallets or other raised surfaces. Do not double stack rolls.
 - 1. Protect unused felt from weather, sunlight, and moisture when left overnight or when work is not in progress.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit siding installation and related work to be performed according to manufacturer's written instructions.
 - 1. Field-Finished Siding: Proceed with installation of siding only when existing and forecast weather conditions permit installation and the immediate application of at least one coat of specified finish on siding before it is exposed to rain, snow, or dampness.
 - a. Proceed with installation only after base or primer coat has been applied to every surface of siding units and has dried.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Decay Resistance: Provide wood products that are preservative treated according to AWPA U1, chromated copper arsenate (CCA) pressure treatment; with a minimum of 0.40 lb/cu. ft. retention.
 - 1. Identification: Attach a label to each bundle of wood products; identify manufacturer and include chemical treatment, method of application, purpose of treatment, and warranties available.
- B. Grading Rules: Provide siding that complies with CSSB's grading rules for products indicated.
 - 1. Identification: Attach a label to each bundle of siding that identifies manufacturer, type of product, grade, dimensions, and identification mark of grading agency.

2.2 UNDERCOURSING

- A. Cedar Undercoursing Shingles: Smooth-sawn western red cedar shingles.
 - 1. Size: Length matching exposed siding and in manufacturer's standard thickness.
 - 2. Grade: Undercoursing.
 - 3. Finish: Match exposed siding.

- B. Ribbon-Coursed-Wall Undercoursing: Match type, length, thickness, and grade of exposed siding of outercourse.

- 1. Finish: Match exposed siding of outercourse.

2.3 EXPOSED SHAKE SIDING

- A. Split Cedar Shakes: Hand-split and resawn western red cedar shakes; split face and sawn back.

- 1. Grade: Premium No. 1.
 - 2. Length: 24 inches
 - 3. Thickness: 3/4 inch at butt.
 - 4. Finish: Paint

- a. Color: White

2.4 ACCESSORIES

- A. Felt Weather-Resistive Barrier: ASTM D 226/D 226M, Type II asphalt-saturated organic felt, nonperforated.

- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable rubberized-asphalt compound bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin.

- 1. Minimum Overall Thickness: 0.040 inch
 - 2. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for applicable substrate.

- C. Nails: ASTM F 1667, stainless-steel, Type 316 wire nails, sharp pointed, and of sufficient length to penetrate a minimum of 3/4 inch into sheathing.

- 1. Shingles: Use box or casing nails.
 - 2. Shakes: Use box nails.
 - 3. Felt Weather-Resistive Barrier: Use roofing nails.
 - 4. Nails in Contact with Metal Flashing: Use nails made from same metal as flashing.

- D. Cedar Lath Strip: Western red cedar, clear heartwood, a minimum of 1-1/2 inches wide.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FELT WEATHER-RESISTIVE BARRIER INSTALLATION

- A. General: Comply with felt manufacturer's written installation instructions and CSSB recommendations applicable to products and applications indicated unless more stringent requirements apply.
- B. Cover exposed exterior surface of sheathing with felt nailed to framing immediately after sheathing is installed.
 - 1. Apply horizontally with a 2-inch overlap and a 6-inch end lap. Wrap around inside and outside corners 4 inches.
 - 2. Cut back felt 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 - 3. Apply felt to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.

3.3 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing to comply with manufacturer's written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. Lap flashing over felt weather-resistive barrier at bottom and sides of openings.
 - 4. Lap felt weather-resistive barrier over flashing at heads of openings.
 - 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.4 SINGLE-COURSED WALLS

- A. Install products according to manufacturer's written instructions and recommendations in CSSB's "Exterior and Interior Wall Manual."
- B. Install products, beginning at base of wall.
- C. Starter Undercourse: Install a single course of undercoursing at the base of the wall in a continuous straight line.
 - 1. Extend 1 inch below top of foundation wall.
 - 2. Match fastening and corner treatment of siding.
- D. Exposed Siding:

1. Install starter (first) course of exposed siding over starter undercourse with butts 1/2 inch lower than undercourse butts.
2. Offset joints in first course of exposed siding a minimum of 1-1/2 inches from joints in starter undercourse.
3. Install succeeding exposed siding courses with joints offset a minimum of 1-1/2 inches between adjacent courses.
4. Install exposed siding courses with butt lines even.
5. Fasten each unit with two concealed nails spaced 3/4 to 1 inch from edges and 1 inch above butt line of succeeding course. For units wider than 10 inches, add two concealed fasteners, spaced 1 inch apart, to the center of the unit. Drive fasteners flush with top surface of units without crushing wood.
6. Interior Corner Treatment: Laced, with flashing behind.
7. Exterior Corner Treatment: Laced

E. Weather Exposure and Spacing:

1. Shakes:
 - a. Maintain weather exposure of 10-1/2 inches for 24-inch-
 - b. Install primed shakes with sides abutting Space shakes 1/4 inch apart maximum.

END OF SECTION 074624

SECTION 075216 - SBS MODIFIED BITUMEN ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The Work of this Section includes providing all plant, labor, materials, equipment, testing and services necessary to complete the work shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Remove existing gravel surfacing, roofing, flashing, insulation, vapor barrier, underlayment, and wood blocking. Clean residual material from the surface of the deck.
 - a. The work may include removing asbestos containing roofing materials. Refer to the asbestos abatement specification for additional information and asbestos removal requirements.
2. Install a new SBS Modified Bitumen roofing system, including a cover board, roofing plies, a cap sheet, flashing, stripping and roof accessories integrally related to the roof system.
3. Install new flashings at all roof mounted or roof penetrating devices.
4. Provide any miscellaneous mechanical, electrical, hoisting and similar work needed, and adjust, modify, disconnect and reconnect existing roof-mounted and roof-penetrating devices to enable the installation of new roofing and flashings.
5. Refasten loose sections of the existing wooden deck under the Base Bid.
6. Replace deteriorated portions of the existing wooden deck in accordance with the Unit Prices.

- B. Related Requirements

1. Brick & Stone Masonry Repointing - Section 040120.64
2. Miscellaneous Rough Carpentry - Section 061053
3. Exterior PVC Railings - Section 062020
4. Thermal Insulation - Section 072100
5. Asphalt Shingles - Section 07 3113
6. Sheet Metal Flashing & Accessories - Section 07 6200

1.3 CODE APPROVAL REQUIREMENTS

- A. Install roofing and insulation system components to meet the following minimum requirements:

1. New York State Uniform Fire Prevention and Building Code.
2. Underwriters Laboratories Inc. Class A Fire External Rating for Roof Covering Materials.
3. ASCE 7 minimum uplift resistance calculated using a safety factor of 2.
 - a. Field Zone - 75 psf
 - b. Perimeter Zones - 120 psf
 - c. Corner Zone - 190 psf
- B. Provide written certification from the Manufacturer, before beginning work, to confirm the roofing system meets these requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm ("Installer") with at least 5 continuous years of experience performing roofing work similar to that required for this project, employing personnel skilled in the work specified.
2. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner:
 - a. The reference list shall include at a minimum, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number.
 - b. The Installer shall provide the reference list prior to contract award if requested.
3. The Installer shall directly employ the personnel performing the work of this section.
4. The Installer shall have a full time supervisor on the roof when roofing work is in progress. The Supervisor shall have a minimum of 5 years experience in roofing work similar in nature and scope to this project, and speak fluent English.
 - a. The Installer shall provide the Supervisor's resume prior to contract award if requested.
5. The Installer shall be acceptable to or licensed by the Manufacturer of the primary roofing materials, and provide written certification from the Manufacturer to confirm this prior to award if requested.

- ##### B. Material Quality:
- Obtain each product, including the cover board, base, ply, cap and flashing sheets, and the cements, primers and adhesives from a single Manufacturer which has manufactured the same products in the United States of America for not less than 5 continuous years.

1.5 Pre-Construction Conference: Meet at the project site approximately two weeks prior to starting work, with the Architect, Owner and other representatives to discuss the following:

1. How the building will be kept watertight as old roofing is removed and the work progresses.

2. How new roofing will be coordinated with the installation of the adjoining sloped roofing, the cover board, flashings and other items to provide a watertight installation.
3. Generally accepted industry practice and the Manufacturer's instructions for handling and installing his products.
4. The condition of the substrate (deck), curbs, penetrations and other preparatory work needed.
5. Incomplete submittals; note that progress payments will be not processed until all submittals are received and approved.
6. The construction schedule, weather forecast, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
7. A schedule for Manufacturer and Architect inspections.

1.6 SUBMITTALS

- A. Submit these items far enough in advance to obtain approval prior to performing any work:
 1. Pre-work site and building inspection report with photos to document conditions before work starts.
 2. Written certification from the Manufacturer stating the Installer is acceptable or licensed to install the specified roofing, if not previously provided.
 3. Manufacturer's technical data sheets for each material component.
 4. A sample of the cap sheet.
 5. Samples of Contractor's and Manufacturer's warranty forms.
 6. Simultaneously provide all technical submittals needed for this section.
 - a. Technical submittals shall be prepared and made by the firm that will perform the actual work.
- B. Simultaneously provide all Safety Data Sheets needed for this project, collated by section, in three ring binders. Provide two binders for each building.
- C. Payment requisitions will not be processed until all submittals are received and approved.

1.7 JOB CONDITIONS - CAUTIONS AND WARNINGS

- A. Exercise extreme caution when working on the roof, and with bituminous adhesives, cements and solvents. Avoid excessive exposure to bitumen vapors and fumes. Note that many of the products are flammable.
- B. Observe OSHA requirements and local codes.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in unopened original containers identified with the Manufacturer's name and brand and labeled with pertinent information regarding grades, quantities and types.
 1. Cover stored materials, except sealed cans of primers, cements and asphalt blocks, with watertight tarpaulins immediately upon delivery.

2. Immediately and permanently remove from the site insulation, cants, felts, rolls and similar materials which get wet.
3. Do not overload the structure when storing materials on the roof.
4. Do not store material within 10 feet of a roof edge.
5. Secure all material immediately upon delivery.

B. Store and install materials within the Manufacturer's recommended temperature range.

1.9 GUARANTEE/WARRANTY

- A. Provide a written Manufacturer's "Full System Guarantee/Warranty" which warrants that the roofing system, including the cover board and bituminous flashings, will remain in a watertight condition for a twenty year period beginning upon Final Completion.
1. Guarantee/Warranty coverage shall remain in effect for gust wind speeds up to 72 miles per hour, measured at ground level at the site.
 2. Guarantee and Warranty coverage shall have no dollar value limit.
- B. Provide a Contractor's written Guarantee which warrants that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion:
1. Defective work includes but is not limited to the following types of failure: leakage, delamination, lifting, loosening, splitting, cracking, and undue expansion.
 2. The Contractor's Guarantee shall provide that the Contractor will make the repairs and modifications necessary to enable the work to perform as warranted at his own expense.
 3. The Guarantee shall include the removal and replacement of items or materials installed as part of the original work, if removal is needed to affect guaranteed repairs.
- C. The Manufacturer's and Contractor's Guarantees/Warranties shall be issued no more than 30 days before the satisfactory completion of punch list work.
- D. Guarantees/Warranties shall include the removal and replacement of items or materials installed with the original roof, if removal and replacement is needed to make warranty repairs.
- E. Guarantee/Warranty coverage may be cancelled, for the affected portion of the roof, if the work is damaged by winds in excess of 72 mph, by hail, lightning, insects or animals, by failure of the structural substrate, by exposure to harmful chemicals, by other trades on the roof, or by vandalism, or if the Owner fails to maintain the roof in accordance with, or makes roof alterations contrary to, the Manufacturer's printed recommendations.
- F. Guarantee/Warranty coverage shall be reinstated, for the remainder of the original period; if the Owner restores the roof to the condition it was in prior to the damage occurring.
- G. The Contractor's Surety Company may add a rider to the Performance Bond which clarifies that Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor's Guarantee.

1.10 SUBSTITUTIONS

- A. The following factors will be considered when evaluating a possible alternative to the roofing system specified:
1. The wording and intent of the warranty to be issued.
 2. The financial status, number of years in business and stability of the entity's that will issue the warranty and guaranty.
 3. A reference list of at least five projects of comparable size, with a successful functional history of at least five years, within an approximate fifty mile radius of the Project.
 4. Technical aspects of the system, especially relating to durability, serviceability and performance.
 5. The capacity and history of the Manufacturer in providing technical response, on-site inspections and assistance.
 6. The availability of local authorized applicators to install and maintain the proposed alternate system.
 7. The Manufacturer's willingness and history responding to warranty claims previously made by the Owner, Architect, or any Consultant involved in this project.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Roof system components are specified as products of Siplast Icopal Group to establish a standard of quality. Equal products and systems will be considered if offered as a substitute with sufficient technical data to establish that the substitute meets the criteria established in this specification.
- B. Primary products include:
1. Primer
 2. Cold Adhesive
 3. Cover Board
 4. Cants & Tapered Edge Strips
 5. Asphalt Cement
 6. Base Sheet
 7. Ply Sheet
 8. Cap Sheet
 9. Flashing Sheet

2.2 MATERIALS

- A. Primer: Low VOC asphalt / solvent primer meeting ASTM D41 Type II.

- B. Cover Board Fasteners: No. 14 Fluoropolymer coated corrosion resistant screws and galvanized metal plates.
- C. Cover Board: 1/2 inch thick, moisture resistant, fire rated, square edge, gypsum board with a primed surfaced, manufactured as roof underlayment: Dens Deck Prime or Securock
- D. Cants and Tapered Edge Strips: Factory fabricated from expanded perlite based insulation boards.
- E. Ply Sheet: SBS modified smooth surfaced polyester and glass scrim reinforced base ply sheet meeting ASTM D 6163 Type II, Grade S – Siplast: Paradiene 20
- F. Cap Sheet: Fire resistant SBS modified granular surfaced polyester and glass scrim reinforced cap sheet meeting ASTM D 6163 Type I, Grade G – Siplast: Paradiene 30 BW FR.
- G. Flashing Sheet: Fire resistant SBS modified granular surfaced polyester and glass scrim reinforced cap sheet meeting ASTM D 6163 Type II, Grade G – Siplast: Paradiene 40 BW FR.
- H. Cold Adhesive: asphalt cut-back adhesive containing non-asbestos fibers and bond enhancing modifiers, formulated for use with SBS modified bitumen roofing products on roof inclines that exceed 1/4 inch per foot: Siplast PA-311M Adhesive.
- I. Cold Applied Liquid Flashings: High performance, multi-component, fast curing liquid membrane: Parapro.
- J. Asphalt Cement:
 - 1. Flashing cement - Two component urethane based, trowel grade elastomeric asphalt cement.
 - 2. Utility cement - One component, urethane based, trowel grade elastomeric asphalt cement.

PART 3 - EXECUTION

3.1 GENERAL

- A. Construct the new roofing system in a watertight, workmanlike manner, meeting the guarantee requirements specified herein, in accordance with the drawings, and in conformance with the Manufacturer's requirements except as enhanced in this specification.
- B. Perform work on areas with roof mounted mechanical equipment to coincide with shutdown periods of the equipment. Temporarily cover mechanical equipment air openings and windows next to the work area with 6 mil fire retardant polyethylene so dirt, dust and odors do not enter the equipment or building. Remove the polyethylene at the end of each workday.
- C. Clean the roof substrate of laitance, dirt, oil, grease or other foreign matter which might affect the quality of the installation.
- D. Install roof system components on dry surfaces only. Do not install any items when weather conditions and outside temperatures are not suitable in accordance with the Manufacturer's recommendations.

- E. Complete all work in sequence as quickly as possible so the smallest area possible is under construction at any one time. Complete the entire work area begun each day, the same day, and make all exposed edges watertight at the end of each day's work.

3.2 SUBSTRATE INSPECTION AND DECK REPAIR

- A. Remove existing roofing, insulation, flashings and underlayments - and carefully check the existing deck to confirm it is well secured to the underlying structure and not rotted or otherwise deteriorated.
- B. Immediately notify the Architect and Owner by telephone and in writing if defects in the substrate are discovered.
- C. Maintain the building watertight in the interim, but do not install new roofing until defects have been corrected.

3.3 DECK REPAIR

- A. Replace damaged wood deck sections in accordance with the Unit Prices.
 - 1. Remove damaged deck boards by a length equal to a minimum of two joist bays.
 - 2. Install new tongue and groove boards to match the thickness and size of the existing deck.
 - 3. Fasten each new deck boards to the joists with at least two #12 screws spaced a maximum of 6 inches on center in each joist. Pre-drill the screw holes.

3.4 GYPSUM BOARD

- A. Install gypsum boards over the wood deck in neat straight rows with joints in subsequent rows offset 12 inches. Lay boards with tight joints. Fill spaces over 1/4 inch between boards.
- B. Fasten gypsum board to the deck with galvanized screws and plates. Install the screws to penetrate the wood deck 1 inch.
 - 1. Install 16 screws per 4 by 8 foot board in the field of the roof.
 - 2. Install 28 screws per 4 by 8 foot board in 8 foot wide perimeter zones.
 - 3. Install 32 screws per 4 by 8 foot board in 8 foot wide corner zones.

3.5 ROOF

- A. Starting at the low point of the roof, apply asphalt adhesive uniformly using a notched squeegee, and embed one field sheet ply, lapping each ply 3 inches, and each end lap 6 inches. .
- B. Immediately roll the field sheet with a 75 pound weighted roller after application to ensure complete adhesion and elimination of all air pockets.
- C. Install field sheet flashings, after the field sheet has been installed and before installing the cap sheet.

- D. Starting at the low point of the roof, apply asphalt adhesive uniformly using a notched squeegee, and embed the cap sheet.
- E. Stagger ply lines between the field sheet and cap sheet, half the width of the sheet. Offset the end laps a minimum of 2 feet between the field and the cap sheets, and within each ply.
- F. Overlap cap sheets no less than 4 inches at the ply lines and no less than 6 inches at the ends. Fully adhere all surfaces and laps.
- G. Carefully install cold adhesive, especially under the cap sheet to achieve only the minimum required bleed out and maintain an aesthetically pleasing appearance. Broadcast loose color matching mineral granules over the adhesive bleed out while the bitumen is still sticky, to ensure a monolithic surface color.
- H. Install the cap sheet only after the Manufacturer and Architect have inspected and accepted each section of roof covered with field sheet.

3.6 BASE FLASHING AND STRIPPING

- A. Install a cant between the roof surface and vertical junctures.
- B. Install primer on metal flashing and masonry wall surfaces, and allow it to dry before installing flashings and stripping.
- C. Install each ply of roofing in sequence to the top of the cant and cut it off cleanly; then install the appropriate flashing ply.
- D. Carefully position and adhere each flashing ply, extending the full flashing height, down the cant and out onto the roof a minimum of 4 inches in front of the cant, and 2 inches past the previous ply.
- E. Install separate base and finish ply flashings, in sequence with each ply of membrane.
- F. Overlap adjoining pieces of membrane flashing a minimum of 6 inches.
- G. Roll all membrane flashing and flashing seams to achieve complete adhesion.
- H. Coat both the back of the first flashing ply and the surface to which it is being adhered, with adhesive or flashing cement, then flop the ply into position, i.e., "mop and flop", and then rub the sheet to achieve complete adhesion.
- I. Mechanically attach the top edge of finished flashings by nailing them 6 inches on center about 1 inch from the top of the flashing. Use nails driven through 1 inch diameter flat tin disks into wood nailers. Use Zamac type nail-ins with 1 inch steel washers into masonry walls. Use screws with 1 inch steel washers into metal curbs.
- J. Trowel plastic cement along the top edge of the flashing sheet and over the fastener heads, before positioning the cap flashing over them.

3.7 WALK PADS: Install walk pads at roof access points, e.g., around roof hatches and in front of doors.

3.8 MISCELLANEOUS

- A. Provide any miscellaneous roofing, flashing, caulking, and metal work shown or otherwise needed to leave the Work complete and watertight, executed in a workmanlike manner.

3.9 CLEANING, PROTECTION AND WATERTIGHTNESS

- A. Inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any work.
- B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leakage or damage which was not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.
- C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.
- D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.
- E. Frequently clean up all refuse, rubbish, scrap materials and debris so the work site presents a neat, orderly and workmanlike appearance.
- F. Carefully clean the roof to remove all residual debris when work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

3.10 ROOF INSPECTIONS BY MANUFACTURER

- A. Arrange for an authorized representative of the roofing Manufacturer to make a minimum of three inspections and provide a written report to the Architect and Owner within one week following each inspection, in accordance with this schedule:
 - 1. First inspection during the first two days of new roof installation.
 - 2. Second inspection when roofing is approximately 1/2 complete.
 - 3. Third inspection when all SBS roofing and flashings are installed.
- B. Provide 72 hours advance written notice to the Architect and Owner, so they may have representatives attend the inspection.
- C. Payment requisitions will not be reviewed or approved until the inspection reports are received.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHINGS & SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

1.2 SUMMARY

- A. The Work of this Section includes providing all plant, labor, materials, equipment, testing and services necessary to complete the work shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

- 1. Sheet metal work that is compatible with the roofing systems specified, including cap flashings, hook strips, fascia, drip edges, gravel stops, copings, gutters, leaders, valleys, standing seam panels, and miscellaneous flashings.

- B. Related Requirements

- 1. Brick & Stone Masonry Repointing - Section 040120.64
 - 2. Miscellaneous Rough Carpentry - Section 061053
 - 3. Exterior PVC Railings - Section 062020
 - 4. Thermal Insulation -Section 072100
 - 5. Asphalt Shingles - Section 073113
 - 6. SBS Modified Bitumen Roofing - Section 075216

1.3 CODE APPROVAL REQUIREMENTS

- A. Fabricate and install roof perimeter flashings that comply with the NY State Uniform Fire Prevention and Building Code and with ANSI/SPRI ES-1 "Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems" requirements.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications:

- 1. A firm (Installer) with at least 5 continuous years experience performing sheet metal work similar to that required for this project, employing personnel skilled in the work specified.
 - 2. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner:
 - a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number.
 - b. The Installer shall provide the reference list prior to contract award if requested.

3. The Installer shall directly employ the personnel performing the work of this section.
4. The Installer shall have a full time supervisor on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience with work similar in nature and scope to this project, and speak fluent English.
 - a. The Installer shall provide the Supervisor's resume prior to contract award if requested.
- B. Material Quality: Obtain each product from a single Manufacturer which has manufactured the same product in the United States of America for not less than 5 continuous years.
 1. Obtain copper and pre-finished sheet metal items from the same mill and paint run to maintain consistent color hue and surface finish.
- C. Pre-Construction Conference: Meet at the project site between one and two weeks prior to starting work, with the Architect, Owner and other representatives concerned about the work, to discuss the following:
 1. How the building will be kept watertight as work progresses.
 2. How sheet metal work will be coordinated with the installation of the wood blocking, cover board, roofing, flashings, roof accessories and other items to provide a watertight installation.
 3. Generally accepted industry practice and the Manufacturer's instructions for handling and installing his products.
 4. The condition of the substrate, curbs, penetrations and other preparatory work needed.
 5. Incomplete submittals; note that progress payments will not be processed until all submittals are received and approved.
 6. The construction schedule, weather forecast, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
 7. A schedule for Manufacturer and Architect inspections.

1.5 SUBMITTALS

- A. Submit the following items far enough in advance to obtain approval prior to performing any work:
 1. Pre-work site and building inspection report with photos to document conditions before work starts.
 2. 2 foot long samples of each sheet metal item, to show how it will relate and fit on adjoining masonry and wood blocking assemblies, and with the roof, stripping, and flashings.
 3. 6 inch square pieces of each type of sheet metal to show surface finish, texture and color.

4. Technical literature for each type of sheet metal, sealant and fastener.
5. A sample of the Contractor's guarantee form.
6. Simultaneously provide all technical submittals needed for this project, for all technical sections, collated by section.
 - a. Technical submittals shall be prepared and made by the firm that will perform the actual work.
- E. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders for each building.
- F. Payment requisitions will not be processed until all submittals are received and approved.

1.6 JOB MOCK-UPS

- A. After the submittals are approved, prepare and install in actual job locations, mock-ups of every sheet metal item for inspection and approval by the Architect.
- B. Construct each mock-up of two full lengths of metal, fastened, connected and stripped-in to the related roofing system, to show the following:
 1. The type, gauge, color, cross sectional dimensions and shape, and joint and mitering techniques.
 2. Related masonry work, wood blocking, and the attachment techniques and fasteners for all wood and metal components.
 3. Other related materials and their installation techniques to fully define the detailing of each mock-up.
- C. Mock-ups shall be constructed to establish the minimum standard of materials and workmanship, and to assure that completed work which matches the mock-ups will be fully functional and serve the purpose for it has been designed.
- D. Approved mock-ups may be left in place and incorporated into the permanent installation. Rejected mock-ups shall be removed and replaced until an acceptable mock-up is approved.
- E. Do not purchase or fabricate sheet metal items until mock-up installation, inspection and approval are completed and approval is documented in writing.

1.7 GUARANTEE

- A. Provide a Contractor's written Guarantee which warrants that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion:
 1. Defective work includes but is not limited to the following types of failure: peeling paint, leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, and undue expansion.

2. The Contractor's Guarantee shall provide that the Contractor will make the repairs and modifications necessary to enable the work to perform as warranted at his own expense.
 3. The Guarantee shall include the removal and replacement of items or materials installed as part of the original work, if removal is needed to affect guaranteed repairs.
- B. Provide one Contractor's Guarantee that covers "all work performed" when a single contractor is awarded work specified in multiple Sections.
- C. The Guarantee shall be issued no more than 30 days before the satisfactory completion of punch list work.
- D. The Contractor's Surety Company may add a rider to the Performance Bond which clarifies that Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor's Guarantee.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Copper sheet: ASTM B370, 99.0 % pure copper, thickness 16 ounces per square foot. Use copper for all metal items not otherwise indicated
- B. Zinc-Tin coated copper: copper sheet, coated on both sides, with a smooth uniform coating of zinc and tin, base metal weight 16 ounces per square foot, cold rolled temper, available as FreedomGray Copper by Revere.
- C. Solder:
1. 50-50 tin and lead for plain copper, supplied in one pound bars with the alloy mixture stamped into the bar by the Manufacturer.
 2. Lead free / or pure tin solder for zinc-tin coated copper, Number 497 by Johnson Manufacturing.
- D. Flux:
1. Water-Soluble Liquid Flux, Kester #3345 for iron soldering of brass and copper.
 2. Tin-bearing flux such as "Flux-N-Solder E127 with pure tin" by Johnson Manufacturing.
- E. Aluminum fascias, hook strips, gravel stops and miscellaneous trim: #3105-H14 alloy aluminum, minimum thickness .050 inches unless otherwise indicated, factory finished with a Fluoropolymer Kynar 500 finish, color as selected by the Architect, from the full range of custom and standard colors.
- F. Fasteners: stainless steel, or to match the sheet metal being fastened.
- G. Underlayment: one ply of high temperature ice & water shield and one ply of 5 pound rosin paper.
- H. Exterior mounted gutters accessories: 16 ounce copper ogee style miters and outlet tubes, concealed brass fascia brackets, and copper wire basket strainers.
- I. Sealant: High performance, solvent free, formulated and moisture curing silyl-terminated polyether sealant, ASTM C-920, Type S, Grade NS, Class 25, NovaLink construction sealant by ChemLink, color as selected.

- J. Ice and Water Shield: high temperature 30 mil thick slip resistant buytl based adhesive coated sheet, with a plastic release layer for peel and stick application directly to a prepared roof deck: Grace Ultra.

PART 3 - EXECUTION

3.1 GENERAL

- A. Accurately reproduce the details and design shown, and form profiles, bends and intersections, sharp, true and even. Fabricate sheet metal in the shop whenever possible, and form joints, laps, splices and connections to shed water and condensation in the direction of flow.
- B. Provide any miscellaneous flashing and sheet metal work not shown on the drawings but otherwise needed to leave the project complete and entirely watertight, neatly and carefully executed in a thorough and workmanlike manner.

3.2 INSPECTION

- A. Examine surfaces to receive work of this section and report any defects to the Owner. Commencement of work will be construed as complete acceptance of surfaces.

3.3 INSTALLATION

- A. Fabricate and install copper work in accordance with the current edition of "Copper and Common Sense" as published by the Revere Copper and Brass Company, unless otherwise indicated.
 - 1. Form all joints, except loose locked sealant filled expansion joints, to overlap 2 inches.
 - 2. Secure the joints with rivets spaced 1 inch on center positioned about 1/2 inch from the top edge of the joint, then sweat solder the joint.
 - 3. Use solder only to fill and seal the joint, not for mechanical strength. Form soldered joints continuous, strong and free from defects, with well heated soldering irons. Do not use open flame torches for soldering.
 - 4. Clean soldered joints daily, immediately after soldering, by washing them with soap and water applied with a soft bristle brush, then rinsing with clear water.
- B. Securely fasten and anchor all work, and make provisions for thermal expansion. Submit details of expansion joints for approval. Install fasteners through one edge of metal only, use a hook strip on the other edge.
- C. Use stainless steel pin Zamac type nail-in fasteners, or stainless steel screws and washers with neoprene inserts where fasteners will be exposed.

3.4 CAP FLASHINGS

- A. Install new aluminum cap flashings in saw cut reglets in the masonry walls properly joined to all related materials in a watertight manner.

3.5 COPINGS

- A. Fabricate new copings to engage a continuous 3/4 inch wide hook strip under the outside face, and fasten the copings with exposed stainless steel screws & washers with neoprene inserts / Zamac type nail-in fasteners, driven through 1 inch diameter stainless steel washers with neoprene inserts spaced 18 inches apart through the inside face 1 inch above the bottom hem.
 - 1. Install 6 inch wide cover plates set into a solid bed of sealant at all joints. Overlap, rivet and install sealant at all miters and special conditions. Form the coping to turn up 6 inches at all rising walls, and cover the turn up with a cap flashing.

3.6 DRIP EDGES

- A. Fabricate drip edges to extend 1-1/2 inches past the roof edge, and turn down to ensure water cannot track back and run down the fascia. Secure the drip edge with roofing nails along the top edge, spaced 4 inches apart along the raw metal edge. Form joints in the drip edge with 6 inch wide concealed under plates which duplicate the profile of the drip edge. Set the underplates in a full bed of sealant.

3.7 HOOK STRIPS

- A. Form continuous hook strips with locks that engage the superimposed trim piece a minimum of 3/4 inch, and to cover the entire underside edge of the wood blocking and neatly extend to the building wall.
- B. Fasten hook strips along their bottom edge, just above the 45 degree bend, with nails spaced 4 inches on center into underlying wood blocking; Zamac type nail-in type fasteners spaced 8 inches on center into masonry surfaces, or screws spaced 8 inches on-center into sheet metal surfaces.

3.8 FASCIA

- A. Fabricate new fascia to engage the hook strip 3/4 inch minimum and extend to the top of the wood fascia blocking. Secure the fascia with a continuous hook strip along the bottom edge and roofing nails along the top edge spaced 8 inches apart, positioned to be covered by the roof edge trim. Form joints in the fascia with 6 inch wide concealed under plates which duplicate the profile of the fascia. Set the underplates in a full bed of sealant.

3.9 GUTTERS & DOWNSPOUTS

- A. Carefully remove and save the existing gutters and downspouts, then reinstall them as the work progresses.
 - 1. Furnish and install new hidden fascia brackets as needed to augment the existing brackets to support the gutters with brackets positioned 12 inches on center.
 - 2. Install new inside and outside miters; rivet and solder the miters to the existing gutters.
 - 3. Install new drop tubes and wire basket strainers.

4. Install new downspout elbows, straps and pieces of downspout as needed to augment and reset the existing downspouts; secure the downspouts with leader straps positioned approximately 7 feet apart, and at the same heights all around the building.

3.10 GRAVEL STOPS

- A. Fabricate new gravel stops with 4 inch wide nailing flanges. Secure the gravel stop with a continuous hook strip and by nailing the flange 4 inches apart along the raw edge with roofing nails. Form joints in the gravel stop with a 6 inch wide underplates set in a full bed of sealant. Form the gravel stop to turn up 5 inches at rising walls, extend the stripping up the wall and terminate it under a cap flashing.

3.11 CHIMNEY CAPS & HOODS

- A. Fabricate new chimney caps and hoods from zinc-tin coated copper; to cover the entire top of the chimney, to overlap the exterior bed joint 2 inches, and to extend up and over the flue liners and turn down inside them. Turn the cap down 4 inches inside the chimney if there are no flue liners. Cover all masonry between the flues. Fasten the chimney cap with a hook strip under the outside edge and Zamac type fasteners spaced 12 inches apart along the inside edge if there is no clay flue liner.
- B. Position the hood a minimum of 18 inches above the top of the flues to provide adequate exhaust clearance.
- C. Support the hood with 1/4 by 1-1/2 inch half twisted stainless steel bars, spaced and braced, approximately 12 inches apart at the perimeter of the hood.

3.12 MISCELLANEOUS FLASHINGS

- A. Fabricate and install copper flashings at the sloped roof areas including: valleys; crickets; chimney apron, step and cap flashings; vent pipe flashings; step flashings; ventilator flashings, etc.
- B. Install an 18 inch wide piece of ice shield to strip over the up-hill side of metal flashings, crickets, and over both sides of valley flashings.
- C. Fabricate step flashings 1 inch longer than the unexposed length of a shingle, and to extend 4 inches up the wall and 4 inches onto the roof.
- D. Fabricate apron flashings with 4 inch wide exposed faces which finish with 1/2 inch hems and rounded corners. Fasten the exposed face with stainless steel screws and washers with neoprene inserts spaced uniformly about 12 inches apart along the bottom edge.

3.13 STANDING SEAM ROOF PANELS

- A. Use copper obtained from a single mill run to avoid appearance differences between adjoining sheets. Do not intermix different mill runs or sheet lengths where the finished copper roof is visible to view.

- B. Form standing seam panels from 16 ounce copper pans which are 18 inches wide. Fold the long edges to form double locked seams which finish 1 inch high. Fold the top and bottom edges to form 1-1/2 inch wide flat locked seams.
- C. Install the standing seam panels over one ply of ice and water shield and one ply of rosin paper underlayment.
- D. Secured the panels with 2 inch wide cleats folded into all seams 12 inches apart. Fasten each cleat with two copper or stainless steel ring shank nails and fold the cleat to cover the nail heads.
- E. Rivet and sweat solder seams in flashings next to the standing seam roof panels. Wash the seams after soldering - the same day the panels are installed.

3.14 CLEANING, PROTECTION AND WATERTIGHTNESS

- A. Inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any work.
- B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leakage or damage which was not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.
- C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.
- D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.
- E. Frequently clean up all refuse, rubbish, scrap materials and debris so the work site presents a neat, orderly and workmanlike appearance.
- F. Carefully clean the roof to remove all residual debris when work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

END OF SECTION

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof hatch.

1.3 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories.
 - 1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.
- C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.
- D. Delegated-Design Submittal: For roof hatch indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.

2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 1. Size and location of roof accessories specified in this Section.
 2. Method of attaching roof accessories to roof or building structure.
 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 4. Required clearances.
- B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design roof hatch to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

- C. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF HATCH

- A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
- B. Type and Size: Single-leaf lid, 30 by 96 inches
- C. Internal live load and 20-lbf/sq. ft. internal uplift load.
- D. Hatch Material: Aluminum-zinc alloy-coated steel sheet.
1. Thickness: Manufacturer's standard thickness for hatch size indicated.
 2. Finish: Two-coat fluoropolymer.
 3. Color: As selected by Architect from manufacturer's full range.
- E. Construction:
1. Insulation: Polyisocyanurate board.
 - a. R-Value: 12.0 according to ASTM C 1363.
 2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
 3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
 4. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
- F. Hardware: Spring operators, hold-open arm, stainless-steel spring latch with turn handles, stainless-steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
1. Provide two-point latch on lids larger than 84 inches
- G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
1. Height: 42 inches above finished roof deck.
 2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
 3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
 4. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
 5. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.

6. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
7. Fabricate joints exposed to weather to be watertight.
8. Fasteners: Manufacturer's standard, finished to match railing system.
9. Finish: Manufacturer's standard.
 - a. Color: As selected by Architect from manufacturer's full range.

2.3 MISCELLANEOUS MATERIALS

- A. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWWA C2; not less than 1-1/2 inches thick.
- B. Underlayment:
 1. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
- C. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- F. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof-Hatch Installation:
 - 1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 - 2. Attach safety railing system to roof-hatch curb.
 - 3. Attach ladder-assist post according to manufacturer's written instructions.
- D. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078100 - APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes sprayed fire-resistive materials for chimney lining.

1.3 DEFINITIONS

- A. SFRM: Sprayed fire-resistive materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site
 - 1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Manufacturer's Installation/Application Instructions

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of fireproofing.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide sprayed refractory mortar, including auxiliary materials, according to requirements of manufacturer's written instructions.
- B. Source Limitations: Obtain refractory mortar and related products from single source.

2.2 SPRAYED INSULATING MATERIALS

- A. Sprayed Insulating Material: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.
 - 1. Sprayed refractory mortar shall be "Chamber Coat" manufactured by Heat Shield, C/O Saver Systems, Richmond, IN.
 - 2. Listed UL 2505
 - 3. 20 Year Warranty.
 - 4. Finish:
 - a. Color: As selected by Architect from manufacturer's full range

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with refractory mortar and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.

1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of mortar with substrates under conditions of normal use or fire exposure.
2. Verify that objects penetrating mortar, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Verify that substrates receiving mortar are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with coating application.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of materials during application.
- B. Clean substrates of substances that could impair bond.

3.3 APPLICATION

- A. Comply with coating manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve ratings indicated.
- B. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

3.4 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

END OF SECTION 078100

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Butyl joint sealants.
 - 3. Latex joint sealants.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
- C. Manufacturers: Dew/Corning, General electric, Pecora

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 50, NT: Single-component, non-sag, plus 50 percent and minus 50 percent movement capability, non-traffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

2.3 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

2.4 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.5 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Non-staining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bi-cellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces not subject to significant movement.
 - 1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Acrylic latex.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Concealed mastics.
 - 1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Butyl-rubber based.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Interior fire rated steel doors and frames.
- B. Related Requirements:
 - 1. Section 087100 Door Hardware for door hardware for hollow-metal doors.

1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal 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.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Pioneer Industries
- B. Bilt-Rite Steel Buck Corp.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Standard-Duty Doors and Frames: SDI A250.8, Level 1; SDI A250.4, Level C. At locations indicated in the Door and Frame Schedule.
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/8 inches
 - c. Face: Uncoated steel sheet, minimum thickness of 18 gal.
 - d. Edge Construction: Model 1, Full Flush
 - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
 - f. Core: Manufacturer's standard
 - g. Fire-Rated Core: Manufacturer's standard vertical steel stiffener core for fire-rated doors.

2. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.042 inch
 - b. Construction: Welded
3. Exposed Finish: Prime.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet
 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

2.5 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.6 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding, or by rigid mechanical anchors.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
- B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 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. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11 NAAMM-HMMA 840.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - 2. Fire-Rated Openings: Install frames according to NFPA 80.
 - 3. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 4. Solidly pack mineral-fiber insulation inside frames.
 - 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 - 6. 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.
 - 7. Installation Tolerances: Adjust hollow-metal frames 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, 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 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8 NAAMM-HMMA 841 and NAAMM-HMMA guide specification indicated.

3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081433 - STILE AND RAIL WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Exterior stile and rail wood door for Main Entrance.
 - 2. Aluminum clad wood and glass doors.
 - 3. Interior wood panel and louverd doors.
 - 4. Fitting stile and rail wood doors to frames and machining for hardware.

- B. Related Requirements:

- 1. Section 099000 Painting for field finishing doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include details of construction and glazing.
 - 2. Include factory-finishing specifications.

- B. Shop Drawings: For wood doors. Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data, including the following:

- 1. Dimensions of doors for factory fitting.
 - 2. Locations and dimensions of mortises and holes for hardware.
 - 3. Undercuts.
 - 4. Doors to be factory finished and finish requirements.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of door, from manufacturer.

- B. Sample Warranty: For special warranty.

- C. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in opaque plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship, or have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, within specified warranty period.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Exterior Doors: Five years.
 - b. Interior Doors: Five years.
 - c. Insulating Glass Vision Panels: Three years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of stile and rail wood door from single manufacturer.

2.2 MATERIALS

- A. General: Use only materials that comply with referenced standards and other requirements specified.
 - 1. Assemble exterior doors and sidelites, including components, with wet-use adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.
 - 2. Assemble interior doors, including components, with either dry-use or wet-use adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.

2.3 EXTERIOR STILE AND RAIL WOOD DOORS

- A. Thermal Transmittance: Maximum whole fenestration product U-factor of 0.40, according to AAMA 1503, ASTM E 1423, or NFRC 100.
- B. Exterior Stile and Rail Wood Doors Type SRD-#: Exterior doors complying with WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors," and with other requirements specified.
 - 1. Main Entrance door – Custom six panel to match existing door
 - a. Manufacturer: Upstate Door, Warsaw, NY
 - b. Description: 2-1/4 inch thick solid Douglas Fir
 - c. Panel Design: Upstate #E-60 dimensions to match existing.
- C. Exterior Aluminum Clad Wood and Glass Entry Doors
 - 1. Panel and glass doors to match existing
 - a. Manufacturer: Anderson Windows, Inc, A-series
 - b. Description: Residential entry door with extruded aluminum exterior painted maple interior, insulated glass upper section with 1 1/2" wide to match existing, aluminum sill grilles.
 - c. Glass-tempered insulated Low-E4 Sun

2.4 INTERIOR STILE AND RAIL WOOD DOORS

- A. Interior Stile and Rail Wood Doors Type SRD-#: Interior doors complying with WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors," and with other requirements specified.
 - 1. WDMA Design Group: 1-3/8 Interior Panel Doors.
 - a. Panel Design: 6 panel to match existing.
 - 2. Finish and Grade: Opaque and Standard.
 - 3. Wood Species: Manufacturer's standard softwood species and cut.
 - 4. Stile and Rail Construction: veneered edge- and end-glued lumber.
 - 5. Raised-Panel Construction: Edge-glued solid lumber.
 - 6. Flat-Panel Thickness: Manufacturer's standard, but not less than that required by WDMA I.S.6 for design group indicated.
 - 7. Molding Profile (Sticking): Manufacturer's standard.
 - 8. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S.6 and grade specified. Include panel design number if applicable.

2.5 INTERIOR LOUVER DOORS

A. Interior full louver wood door at Kitchen FCC closet

1. 13/8" Thick stile, rail and louver design
2. Douglas – Fir, painted

2.6 STILE AND RAIL WOOD DOOR FABRICATION

A. Fabricate stile and rail wood doors in sizes indicated for field fitting.

B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels unless otherwise indicated:

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/2 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide not more than 3/8 inch from bottom of door to top of threshold.
 - a. Comply with NFPA 80 for fire-rated doors.
2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2.7 SHOP PRIMING

A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 099100 "Painting".

B. Doors for Transparent Finish: Shop prime faces and all four edges with stain (if required), other required pretreatments, and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing." Seal edges of cutouts and mortises with first coat of finish.

2.8 FINISHING

C. Finish wood doors at factory.

D. Opaque Finish:

1. Grade: Custom.
2. Finish: AWT's, AWMAC's, and WT's "Architectural Woodwork Standards" System 10, UV curable, water based.
3. Finish: WDMA OP-4 conversion varnish

4. Color: As selected by Architect from manufacturer's full range.
5. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 3/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

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Contract No. 16-529

Main House Renovations Lasdon Park
Arboretum and Veterans Memorial

END OF SECTION 081433

SECTION 083613 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes electrically operated sectional doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of sectional door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 - 4. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied finishes.
 - 1. Include Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Failure of components or operators before reaching required number of operation cycles.
 - c. Faulty operation of hardware.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
 - e. Delamination of exterior or interior facing materials.
 - 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Manufacturer: General Doors Corporation, Bristol, PA
- B. Source Limitations: Obtain operators and controls from sectional door manufacturer.
- C. Description: Newport model, 2" thick, steel insulated steel garage doors

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
 - 1. Design Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft, acting inward and outward.

2. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
 - a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
 - b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.
3. Operability under Wind Load: Design overhead coiling doors to remain operable under design uniform pressure (velocity pressure) of 20 lbf/sq. ft. wind load, acting inward and outward.

2.3 DOOR ASSEMBLY

- A. Steel Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.
- B. Air Infiltration: Maximum rate of 0.4 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E 283.
- C. Steel Sections: Zinc-coated (galvanized) steel sheet with G60 zinc coating.
 1. Section Thickness: 2 inch.
 2. Exterior-Face, Steel Sheet Thickness: 0.028-inch nominal coated thickness.
 - a. Surface: Manufacturer's standard, paneled.
 3. Insulation: Foamed in place, polyurethane, R18.
 4. Interior Facing Material: Zinc-coated (galvanized) steel sheet with a nominal coated thickness of manufacturer's recommended dimension to comply with performance requirements.
- D. Track Configuration: Low-headroom.
- E. Weatherseals: Fitted to bottom and top and around entire perimeter of door.
- F. Windows: As shown on drawings; installed with glazing of the following type:

Tempered Insulating Glass: Manufacturer's standard

- G. Locking Devices: Equip door with locking device assembly.
 1. Locking Device Assembly: locking bars, operable from inside and outside, with cylinders.
- H. Counterbalance Type: Torsion spring
- I. Electric Door Operator:
 1. Usage Classification: Medium duty, up to 12 cycles per hour and up to 50 cycles per day.
 2. Operator Type: Manufacturer's standard for door requirements.

3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
4. Motor Exposure: Exterior, dusty.
5. Emergency Manual Operation: Push-up type.
6. Obstruction-Detection Device: Automatic electric sensor edge on bottom section.
 - a. Sensor Edge Bulb Color: Black.
7. Control Station: Interior-side mounted.

J. Door Finish:

1. Baked-Enamel or Powder-Coat Finish: Color and gloss as selected by Architect from manufacturer's full range.
2. Finish of Interior Facing Material: Match finish of exterior section face.

2.4 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 STEEL DOOR SECTIONS

- A. Exterior Section Faces and Frames: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated zinc coating and thickness.
1. Fabricate section faces from single sheets to provide sections not more than 24 inches high and of indicated thickness. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weather-resistant seal, with a reinforcing flange return.
 2. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.
- B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064-inch- nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.064-inch- thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches apart.
- C. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place. Ensure that reinforcement does not obstruct vision lites.
- D. Provide reinforcement for hardware attachment.
- E. Board Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard CFC-free polystyrene or polyurethane board insulation, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84; or with

glass-fiber-board insulation. Secure insulation to exterior face sheet. Enclose insulation completely within steel sections and the interior facing material, with no exposed insulation.

- F. Interior Facing Material: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated thickness.
- G. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

2.6 TRACKS, SUPPORTS, AND ACCESSORIES

- A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings. Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides for required door type, size, weight, and loading.
 - 1. Galvanized Steel: ASTM A 653/A 653M, minimum G60 zinc coating.
 - 2. Slope tracks at an angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.
 - 3. Track Reinforcement and Supports: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches apart for door-drop safety device.
 - a. For Vertical Track: Continuous reinforcing angle attached to track and attached to wall with jamb brackets.
 - b. For Horizontal Track: Continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.
- B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.
- C. Windows: Manufacturer's standard window units of type, size, and in arrangement indicated. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors and elastic glazing compound for wood doors, as required. Provide removable stops of same material as door-section frames.
- D.
 - 1. Lock Cylinders: standard with manufacturer.
 - 2. Keys: Three for each cylinder.

2.7 HARDWARE

- A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

- B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch- nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible. Provide double-end hinges where required, for doors more than 16 feet wide unless otherwise recommended by door manufacturer.
- C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- diameter roller tires for 3-inch- wide track and 2-inch- diameter roller tires for 2-inch- wide track.
- D. Push/Pull Handles: Equip each push-up operated or emergency-operated door with galvanized-steel lifting handles on each side of door, finished to match door.

2.8 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: Cylinders standard with manufacturer.
 - 2. Keys: Three for each cylinder.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.9 COUNTERBALANCE MECHANISM

- A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.
- B. Weight Counterbalance: Counterbalance mechanism consisting of filled pipe weights that move vertically in a galvanized-steel weight pipe. Connect pipe weights with cable to weight-cable drums mounted on torsion shaft made of steel tube or solid steel.

2.10 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.

2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.
 1. Trolley: Trolley operator mounted to ceiling above and to rear of door in raised position and directly connected to door with drawbar.
 2. Jackshaft, Center Mounted: Jackshaft operator mounted on the inside front wall above door and connected to torsion shaft with an adjustable coupling or drive chain.
 3. Jackshaft, Side Mounted: Jackshaft operator mounted on the inside front wall on right or left side of door and connected to torsion shaft with an adjustable coupling or drive chain.
- D. Motors: Reversible-type motor with controller for motor exposure indicated.
 1. Electrical Characteristics:
 - a. Phase: Single phase.
 - b. Volts: 115 V.
 - c. Hertz: 60.
 2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
 3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
 5. Use adjustable motor-mounting bases for belt-driven operators.
- E. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
 1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
 2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom section. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

- a. Self-Monitoring Type: Four-wire configured device designed to interface with door-operator control circuit to detect damage to or disconnection of sensor edge.
- 3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure, push-button control labeled "Close."
- 1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- H. Emergency Manual Operation: Equip electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 35 lbf.
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Tracks:
 - 1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
 - 2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
- C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.

- D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780/A 780M.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 083613

SECTION 085200 - WOOD WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes vinyl-clad wood windows.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 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, discuss, and coordinate the interrelationship of wood windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
 - 3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 - 4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for wood windows, installation instructions.
- B. Shop Drawings: For wood windows.
 - 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, jambs, sill and head trim exterior and interior and details of installation, including anchor, flashing, and sealant installation.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
2. Warranty Period:
 - a. Window: (10) years from date of Substantial Completion.
 - b. Glazing Units: (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wood windows from single source from single manufacturer.
- B. Basis of Design: Anderson Corporation, 400 series vinyl clad wood.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 1. Window Certification: WDMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 1. Minimum Performance Class: R.
 2. Minimum Performance Grade: 15.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.27.

2.3 WOOD WINDOWS

- A. Vinyl-Clad Wood Windows:
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
 1. Casement: Project out.
 2. Awning: Project out.

3. Double hung.
 4. Horizontal sliding.
 5. Fixed.
- C. Frames and Sashes: Fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide; water-repellent preservative treated.
1. Exterior Finish: Vinyl-clad wood.
 - a. Color: White.
 2. Interior Finish: White.
- D. Insulating-Glass Units: ASTM E 2190.
1. Glass: ASTM C 1036, Type 1, Class 1, q3. Anderson Low E Pressure Sun Glass
 - a. Tint: Clear.
 - b. Kind: Fully tempered where indicated on Drawings.
 2. Lites: Two.
 3. Filling: Fill space between glass lites with argon
 4. Low-E Coating: Pyrolytic on second surface.
- E. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- F. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- G. Projected Window Hardware:
1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
 - a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.
 2. Hinges: Manufacturer's standard type for sash weight and size indicated.
 3. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 29 inches tall and two arms on taller sashes.

H. Hung Window Hardware:

1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.

I. Horizontal-Sliding Window Hardware:

1. Sill Cap/Track: Manufacturer's standard dimensions and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.
2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
3. Roller Assemblies: Low-friction design.

J. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

K. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 ACCESSORIES

A. Dividers (False Muntins): Provide divider grilles in designs indicated for each sash lite.

1. Quantity and Type: Two per sash, removable from exposed surfaces of interior and permanently located at exterior lite.
2. Material: Manufacturer's standard.
3. Pattern: As indicated on Drawings.
4. Profile: As selected by Architect from manufacturer's full range.
5. Color: As selected by Architect from manufacturer's full range White.

2.5 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location: At Kitchen areas as noted. Full, outside for double-hung Full, outside for sliding sashes.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
 2. Finish for Interior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range White.
 3. Finish for Exterior Screens: Matching color and finish of cladding.
- C. Glass-Fiber Mesh Fabric: 20-by-20 mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D 3656/D 3656M.
1. Mesh Color: Manufacturer's standard.

2.6 FABRICATION

- A. Fabricate wood windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze wood windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085200

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.

1.3 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner.
- C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
 - 1. Tag Samples with full product description to coordinate Samples with door hardware schedule.
- C. Samples for Initial Selection: For each type of exposed finish.

- D. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
 3. Content: Include the following information:
 - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
 - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
- E. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Architectural Hardware Consultant.
- B. Product Certificates: For each type of electrified door hardware.
1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Field quality-control reports.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.8 WARRANTY

- A. Special Warranty: 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 doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of door hardware from single manufacturer.

- 1. Manufacturers: Sargeant, Russwin, Corbin

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- C. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design"
 - 1. 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
 - 2. Comply with the following maximum opening-force requirements:

- a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
- 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
 - 4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
 - 5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.3 SCHEDULED DOOR HARDWARE

- A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.

- 1. Door hardware is scheduled in Part 3.

2.4 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

2.5 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Bored Locks: Minimum 1/2-inch latchbolt throw.
 - 2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
 - 3. Deadbolts: Minimum 1-inch bolt throw.
- C. Lock Backset: 2-3/4 inches unless otherwise indicated.
- D. Lock Trim:
 - 1. Description: As indicated on Schedule
 - 2. Levers: Cast. Escutcheons (Roses): Cast.
 - 3. Dummy Trim: Match lever lock trim and escutcheons.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
- F. Bored Locks: BHMA A156.2; Grade 1; Series 4000.

2.6 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.

2.7 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.
- B. Standard Lock Cylinders: BHMA A156.5; Grade 1 permanent cores; face finished to match lockset.
 - 1. Core Type: Removable.
- C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- D. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.8 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.
 - 1. No Master Key System: Only change keys operate cylinders.
 - a. Provide three cylinder change keys.
 - 2. Keyed Alike: Key all cylinders to same change key.
- B. Keys: Nickel silver.

2.9 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; bronze unless otherwise indicated.

2.10 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.11 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

2.12 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
 - b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
 - 3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 - 4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.13 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches door height greater than 90 inches.
- E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
- F. Key Control System:
- G. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- H. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- I. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- J. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- K. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
 - 2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.
 - 3. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

3.7 DOOR HARDWARE SCHEDULE –SEE HARDWARE SCHEDULE ON DRAWING A14

END OF SECTION 087100

SECTION 092300 - GYPSUM PLASTERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Gypsum plastering on expanded-metal lath for patching.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, contamination, corrosion, construction traffic, and other causes.

1.5 FIELD CONDITIONS

- A. Comply with ASTM C 842 requirements or gypsum plaster manufacturer's written recommendations, whichever are more stringent.
- B. Room Temperatures: Maintain temperatures at not less than 55 deg F or greater than 80 deg F for at least seven days before application of gypsum plaster, continuously during application, and for seven days after plaster has set or until plaster has dried.
- C. Avoid conditions that result in gypsum plaster drying out too quickly.
 - 1. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
 - 2. Maintain relative humidity levels for prevailing ambient temperature that produce normal drying conditions.
 - 3. Ventilate building spaces in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Where indicated, provide gypsum plaster assemblies identical to those of assemblies tested for fire resistance according to ASTM E 119 by a qualified testing agency.

2.2 EXPANDED-METAL LATH

- A. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet with ASTM A 653/A 653M, G60 hot-dip galvanized-zinc coating.
 - 1. Diamond-Mesh Lath:
 - a. Type: Self-furring.
 - b. Weight: 2.5 lb/sq. yd.
 - 2. Flat-Rib Lath: Rib depth of not more than 1/8 inch 2.75 lb/sq. yd.

2.3 ACCESSORIES

- A. General: Comply with ASTM C 841, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

2.4 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Bonding Compound: ASTM C 631.
- C. Fasteners for Attaching Metal Lath to Substrates: ASTM C 841.
- D. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter unless otherwise indicated.
- E. Mix Additives: Use gypsum plaster accelerators and retarders from plaster manufacturer if required by Project conditions. Use only additives that manufacturer recommends in writing for use with plaster to which it is added.

2.5 BASE-COAT PLASTER MATERIALS

- A. Provide material compatible with existing conditions: Lightweight-Gypsum Ready-Mixed Plaster: ASTM C 28/C 28M, with mill-mixed perlite aggregate.
 - 1. Manufacturer: U.S. gypsum
- B. Gypsum Neat Plaster: ASTM C 28/C 28M, for use with job-mixed aggregates.

1. Manufacturer: U.S. Gypsum

C. Aggregates for Base-Coat Plasters: ASTM C 35, sand.

2.6 FINISH-COAT PLASTER MATERIALS

A. Provide material compatible with existing conditions

B. Gypsum Gaging Plaster: ASTM C 28/C 28M.

C. Gypsum Ready-Mixed Finish Plaster: Manufacturer's standard, mill-mixed, gaged, interior finish.

D. Gypsum Keene's Cement: ASTM C 61/C 61M.

E. Lime: ASTM C 206, Type N, normal finishing hydrated lime.

F. Aggregates for Float Finishes: ASTM C 35, sand; graded according to ASTM C 842.

2.7 PLASTER MIXES

A. Mixing: Comply with ASTM C 842 and manufacturer's written instructions for applications indicated.

B. Mix Additives: Use accelerators and retarders, if required by Project conditions, according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

3.3 INSTALLATION, GENERAL

A. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.

3.4 INSTALLING EXPANDED-METAL LATH

- A. Expanded-Metal Lath: Install according to ASTM C 841.
 - 1. Partition Framing and Vertical Furring: Install flat-diamond-mesh lath.
 - 2. Flat-Ceiling and Horizontal Framing: Install Flat-diamond-mesh lath.
 - 3. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh lath.
 - 4. Solid-Plaster Partitions: Where supported by channel studs and L-runners, install flat-diamond-mesh lath.
 - 5. Studless Solid-Plaster Partitions: Where supported by L-runners, install 3/8-inch rib lath.

3.5 INSTALLING ACCESSORIES

- A. General: Install according to ASTM C 841.
- B. Cornerbeads: Install at external corners.
- C. Casing Beads: Install at terminations of plasterwork, except where plaster passes behind and is concealed by other work and where metal screeds, bases, or frames act as casing beads.
- D. Control Joints: Locate as approved by Architect for visual effect, with spacing between joints in either direction not exceeding the following:
 - 1. Partitions: 30 feet
 - 2. Ceilings: 30 feet
- E. Aluminum Trim: Install according to manufacturer's written instructions.

3.6 PLASTER APPLICATION

- A. General: Comply with ASTM C 842.
 - 1. Do not deviate more than plus or minus 1/8 inch in 10 feet from a true plane in finished plaster surfaces when measured by a 10-foot straightedge placed on surface.
 - 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 - 3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Bonding Compound: Apply on unit masonry and concrete substrates for direct application of plaster.
- C. Base-Coat Plaster:
 - 1. Over Expanded-Metal Lath:
 - a. Scratch Coat: Gypsum neat plaster with job-mixed sand
 - b. Brown Coat: Lightweight-gypsum ready-mixed plaster

D. Finish Coats:

1. Smooth-Troweled Finishes:
 - a. Locations: Provide smooth-troweled finish unless otherwise indicated
2. Float Finishes:
 - a. Materials: Gypsum gaging plaster and lime putty
 - b. Locations: Provide float finish unless otherwise indicated
 - c. Concealed Plaster:
3. Where plaster application is concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
4. Where plaster application is concealed above suspended ceilings and in similar locations, omit finish coat.
5. Where plaster application is used as a base for adhesive application of tile and similar finishes, omit finish coat.

3.7 PLASTER REPAIRS

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.8 CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of other work after plastering is complete. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 092300

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or blotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C 1396/C 1396M.
 - 1. Manufacturer: U.S. Gypsum
- B. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Manufacturer: U.S. Gypsum
 - 2. Core: 5/8 inch , Type X
 - 3. Long Edges: Tapered.
 - 4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
 - 1. Manufacturer: U.S. Gypsum
 - 2. Core: 1/2 inch , regular type
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- B. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.
 - 1. Manufacturer US Gypsum
 - 2. Core: 5/8 inch, Type X.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet
 - 2. Shapes:

- a. Cornerbead.
- b. Bullnose bead.
- c. LC-Bead: J-shaped; exposed long flange receives joint compound.
- d. L-Bead: L-shaped; exposed long flange receives joint compound.
- e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
- f. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound
- D. Joint Compound for Tile Backing Panels:
 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 2. Cementitious Backer Units: As recommended by backer unit manufacturer.
 3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
 1. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling 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.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. 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. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber,

including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.
2. Type X: As indicated on Drawings
3. Ceiling Type: As indicated on Drawings.
4. Foil-Backed Type: As indicated on Drawings
5. Mold-Resistant Type: As indicated on Drawings

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels [vertically (parallel to framing)] [horizontally (perpendicular to framing)] unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying face layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum

board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at [showers, tubs, and where indicated] [locations indicated to receive tile]. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. Bullnose Bead: Use where indicated.
 - 3. U-Bead: Use where indicated.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile, Where indicated on Drawings.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Ceramic mosaic floor tile.
 - 2. Glazed wall tile and base.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For tile, grout, and accessories involving color selection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 10 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 10 percent of amount installed for each type, composition, and color indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.3 TILE PRODUCTS

- A. Ceramic Tile Type CT-<#>: Factory-mounted glazed ceramic mosaic tile.
 - 1. Daltile
 - 2. Composition: Porcelain

3. Certification: Porcelain tile certified by the Porcelain Tile Certification Agency.
4. Module Size: 2 by 2 inches
5. Face: Plain with cushion edges.
6. Surface: Smooth, without abrasive admixture.
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Finish: Mat, opaque glaze.
9. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
10. Grout Color: As selected by Architect from manufacturer's full range.
11. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

B. Ceramic Tile Type CT-~~#~~: Glazed wall tile.

1. Daltile
2. Module Size: 4-1/4 by 4-1/4 inches
3. Face Size Variation: Rectified.
4. Thickness: 5/16 inch
5. Face: Plain with cushion edges
6. Finish: Bright, opaque glaze.
7. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
8. Grout Color: As selected by Architect from manufacturer's full range.
9. Mounting: Factory, back mounted.
10. Mounting: PregROUTED sheets of tiles are factory assembled and grouted with manufacturer's standard white silicone rubber.
11. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base for Portland Cement Mortar Installations: Coved, module size 4-1/4 by 4-1/4 inches.
 - b. Base for Thinset Mortar Installations: Straight, module size 4-1/4 by 4-1/4 inches
 - c. -butted square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503/C 503M, with a minimum abrasion resistance of **10** according to ASTM C 1353 or ASTM C 241/C 241M and with honed finish.
1. Description: Uniform, fine- to medium-grained white stone with gray veining.
 2. Description: Match Architect's sample.

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.
 - 1. Thickness: 1/2 inch in maximum lengths available to minimize end-to-end butt joints.

2.6 SETTING MATERIALS

- A. Organic Adhesive: ANSI A136.1, Type I.
- B. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- C. Standard Cement Grout: ANSI A118.6.

2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/8 inch
 - 2. Glazed Wall Tile: 1/16 inch
- H. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.4 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.
- D. Interior Floor Installations, Wood Subfloor:
 - 1. TCNA F142; organic adhesive.
 - a. Ceramic Tile Type: 2"x2" Mosaic.
 - b. Grout: Standard sanded cement grout.

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Main House Renovations Lasdon Park
Arboretum and Veterans Memorial

2. Ceramic Tile Installation : TCNA W223; organic adhesive on solid backing.
 - a. Grout: Sand-portland cement

END OF SECTION 093013

SECTION 096400 - WOOD FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Factory-finished wood flooring.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor assembly and accessory. Include plans, sections, and attachment details. Include expansion provisions and trim details.
- C. Samples: For each exposed product and for each color and texture specified, approximately 12 inches long and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.
- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and finishes available for wood flooring.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wood Flooring: Equal to 2 percent of amount installed for each type, color, and finish of wood flooring indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood flooring materials in unopened cartons or bundles.
- B. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet-work is complete and dry.
- C. Store wood flooring materials in a dry, warm, ventilated, weathertight location.

1.6 FIELD CONDITIONS

- A. Conditioning period begins not less than seven days before wood flooring installation, is continuous through installation, and continues not less than seven days after wood flooring installation.
 - 1. Environmental Conditioning: Maintain ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants in spaces to receive wood flooring during the conditioning period.
 - 2. Wood Flooring Conditioning: Move wood flooring into spaces where it will be installed, no later than the beginning of the conditioning period.
 - a. Do not install flooring until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.
 - b. Open sealed packages to allow wood flooring to acclimatize immediately on moving flooring into spaces in which it will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install factory-finished wood flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Mercier engineered floor

2.2 FACTORY-FINISHED WOOD FLOORING

- A. Solid-Wood Flooring: Kiln dried to 6 to 9 percent maximum moisture content; tongue and groove and end matched; with backs channeled.
 - 1. Species: Red oak
 - 2. Grade: Select
 - 3. Cut: Plain sawn
 - 4. Thickness: 3/4 inch
 - 5. Face Width: 5-1/8 inches
 - 6. Lengths: Random-length strips complying with applicable grading rules
 - 7. Edge Style: Square
 - 8. Finish: UV urethane.
 - 9. Color: As selected by Architect from manufacturer's full range

2.3 ACCESSORY MATERIALS

- A. Wood Sleepers and Subfloor: existing

- B. Wood Underlayment: ½" thick exterior glue plywood
- C. Asphalt-Saturated Felt: ASTM D 4869/D 4869M, Type II.
- D. Wood Flooring Adhesive: Mastic recommended by flooring and adhesive manufacturers for application indicated.
 - 1. Adhesive shall have a VOC content of 100 g/L or less.
- E. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood flooring manufacturer.
- F. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines".
- G. Thresholds and Saddles: To match wood flooring. Tapered on each side.
- H. Reducer Strips: To match wood flooring. 2 inches wide, tapered, and in thickness required to match height of flooring.
- I. Cork Expansion Strip: Composition cork strip.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in NWFA's "Installation Guidelines."
- B. Wood Sleepers and Subfloor: Repair or replace damaged material
- C. Wood Underlayment: Screw to existing underlayment

- D. Provide expansion space at walls and other obstructions and terminations of flooring of not less than 3/4 inch (19 mm)
- E. Vapor Retarder: Comply with the following for vapor retarder installation:
 - 1. Wood Flooring Nailed to Wood Subfloor: Install flooring over a layer of asphalt-saturated felt.
- F. Solid-Wood Flooring: Blind nail or staple flooring to substrate.
 - 1. Plank Flooring: For flooring of face width more than 3 inches
 - a. Hardwood: Install countersunk screws at each end of each piece in addition to blind nailing. Cover screw heads with wood plugs glued flush with flooring.

3.4 PROTECTION

- A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.
 - 1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096400

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Vinyl base.
 - 2. Vinyl stair accessories.
 - 3. Vinyl molding accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg or more than 90 deg F

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F
 - 1. Before installation.
 - 2. During installation.

3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 VINYL BASE

- A. Manufacturer: Tarkett, Mercer, Johnsonite
- B. Product Standard: ASTM F 1861, Type TV (vinyl, thermoplastic).
 1. Group: I (solid, homogeneous)
 2. Style and Location:
 - a. Style B, Cove:
- C. Minimum Thickness: 0.125 inch
- D. Height: 4 inches
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Preformed
- G. Inside Corners: Preformed
- H. Colors and Patterns: Match Architect's sample

2.2 VINYL STAIR ACCESSORIES

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Stair Treads: ASTM F 2169, Type TV (vinyl, thermoplastic).
 1. Class: 1 (smooth, flat)
 2. Group: 1 (embedded abrasive strips).
 3. Nosing Style: Round.
 4. Nosing Height: 1-1/2 inches
 5. Thickness: 1/4 inch
 6. Size: Lengths and depths to fit each stair tread in one piece.
- C. Separate Risers: Smooth, flat; in height that fully covers substrate; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

1. Style: Toeless, by length matching treads.
 2. Thickness: 0.125 inch
- D. Landing Tile: Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads
- E. Colors and Patterns: Match Architect's sample

2.3 INSTALLATION MATERIALS

- A. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.

- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from resilient stair treads before applying liquid floor polish.
 - 1. Apply two coat(s).
- E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Vinyl composition floor tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of resilient floor tile.
 - 1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 2. Show details of special patterns.
- C. Samples: Full-size units of each color, texture, and pattern of floor tile required.
 - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- D. Samples for Initial Selection: For each type of floor tile indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F in spaces to receive floor tile during the following periods:
1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION FLOOR TILE

- A. Manufacturer/Series: Tarkett/Signals
- B. Tile Standard: ASTM F 1066, Class 2, through pattern
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch
- E. Size: 12 by 12 inches
- F. Colors and Patterns: As Selected by Architect

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10/P.H.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles square with room axis
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 1. Lay tiles with grain running in one direction
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 1. Remove adhesive and other blemishes from surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply two coats
- E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096816 - SHEET CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Tufted carpet.
 - 2. Carpet cushion.
 - 3. Stair runner – same material as Tufted carpet with “bound” edges

- B. Related Requirements:

- 1. Section 024119 "Selective Demolition" for removing existing floor coverings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include manufacturer's written data on physical characteristics and durability.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.

- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

- 1. Carpet: 12-inch- square Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.
 - 3. Carpet Cushion: 6-inch- square Sample.
 - 4. Carpet Seam: 6-inch Sample.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet and carpet cushion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."
- B. Deliver carpet in original mill protective covering with mill register numbers and tags attached.

1.7 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet and carpet cushion until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

1.8 WARRANTY

- A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.
 - b. Loss of tuft bind strength.
 - c. Excess static discharge.
 - d. Delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Warranty for Carpet Cushion: Manufacturer agrees to repair or replace components of carpet cushion installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty includes removal and replacement of carpet and accessories required by replacement of carpet cushion.

2. Warranty does not include deterioration or failure of carpet cushion due to unusual traffic, failure of substrate, vandalism, or abuse.
3. Failure includes, but is not limited to, permanent indentation or compression.
4. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TUFTED CARPET

- A. Manufacturer: Mohawk, Shaw
- B. Color: Match adjacent room
- C. Pattern: Match adjacent room
- D. Fiber Content: 100 percent nylon 6, 6
- E. Fiber Type: Antron.
- F. Pile Characteristic: Level-loop pile.
- G. Gage: 10
- H. Total Weight: 42oz
- I. Primary Backing: Manufacturer's standard material
- J. Secondary Backing: Manufacturer's standard material
- K. Backcoating: Manufacturer's standard material
- L. Performance Characteristics:
 1. Appearance Retention Rating: Moderate traffic, 2.5 minimum according to ASTM D 7330.
 2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
 3. Dry Breaking Strength: Not less than 100 lbf according to ASTM D 2646.
 4. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) according to AATCC 16, Option E.

2.2 CARPET CUSHION

2.3 Copy this article and re-edit for each product.

- A. Traffic Classification: CCC Class I, moderate traffic.
- B. Rubber Cushion: Flat

2.4 INSTALLATION ACCESSORIES

- A. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI's "CRI Carpet Installation Standard."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.
- B. Examine carpet for type, color, pattern, and potential defects.
- C. Wood Subfloors: Verify the following:
 - 1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

3.2 PREPARATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard" and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 CARPET INSTALLATION

- A. Comply with CRI's "CRI Carpet Installation Standard" and carpet manufacturer's carpet and carpet cushion manufacturers' written installation instructions for the following:
 - 1. Stretch-in installation.
- B. Comply with carpet manufacturer's written instructions and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
 - 1. Stretch-in Carpet Installation: Install carpet cushion seams at 90-degree angle with carpet seams.
- C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

- D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet as marked on subfloor. Use nonpermanent, nonstaining marking device.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI's "CRI Carpet Installation Standard."
- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods recommended in writing by carpet manufacturer and carpet cushion manufacturer

END OF SECTION 096816

SECTION 097720 –DECORATIVE FIBERGLASS REINFORCED WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Prefinished polyester glass reinforced plastic sheets and adhered to existing gypsum board, plaster or brick in the Kitchen.

1.2 SUBMITTALS

- A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- C. Selection Samples: Submit manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.
- D. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.
 - 1. Submit complete with specified applied finish.
 - 2. For selected patterns show complete pattern repeat.
 - 3. Exposed Molding and Trim: Provide samples of each type, finish, and color.
- E. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site (available as downloads for most Marlite's products at <http://www.marlite.com/tech-details.aspx> or by contacting Marlite at info@marlite.com).

1.3 QUALITY ASSURANCE

- A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
 - 1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
 - a. Wall Required Rating – Class C.
- B. Sanitary Standards: System components and finishes to comply with:
 - 1. Westchester County Health Dept.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials factory packaged on strong pallets.
- B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (range of 60 to 75°F) for 48 hours prior to installation.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work
- B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
 - 1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.6 WARRANTY

- A. Furnish one year guarantee against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. Marlite; 1 Marlite Drive, Dover, OH 44622. 800-377-1221 FAX (330) 343-4668 Email: info@marlite.com www.marlite.com.
- B. Product:
 - 1. Standard FRP

2.2 PANELS

- A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
 - 1. Coating: Multi-layer print, primer and finish coats or applied over-layer.
 - 2. Dimensions:
 - a. Thickness – 0.090 “ (2.29mm) nominal
 - b. Width - 4'-0” (1.22m) nominal
 - c. Length – As indicated on the drawings
 - 3. Tolerance:
 - a. Length and Width: +/-1/8 “ (3.175mm)
 - b. Square - Not to exceed 1/8 “ for 8 foot (2.4m) panels or 5/32 “ (3.96mm) for 10 foot (2.4m) panels
- B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.

1. Flexural Strength - 1.0×10^4 psi per ASTM D 790. (7.0 kilogram-force/square millimeter)
 2. Flexural Modulus - 3.1×10^5 psi per ASTM D 790. (217.9 kilogram-force/square millimeter)
 3. Tensile Strength - 7.0×10^3 psi per ASTM D 638. (4.9 kilogram-force/square millimeter)
 4. Tensile Modulus - 1.6×10^5 psi per ASTM D 638. (112.5 kilogram-force/square millimeter)
 5. Water Absorption - 0.72% per ASTM D 570.
 6. Barcol Hardness (scratch resistance) of 35 55 as per ASTM D 2583.
 7. Izod Impact Strength of 72 ft. lbs./in ASTM D 256
- C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.
- D. Front Finish: Smooth Color: As selected by Architect

2.3 MOLDINGS

- A. PVC Trim: Thin-wall semi-rigid extruded PVC.
1. M 350 Inside Corner, [8' length][10' length]
 2. M 360 Outside Corner, [8' length][10' length]
 3. M 365 Division, [8' length][10' length]
 4. M 370 Edge, [8' length][10' length]
 5. Color: Selected by Architect

2.4 ACCESSORIES

- A. Fasteners: Non-staining nylon drive rivets.
1. Match panel colors.
 2. Length to suit project conditions.
- B. Adhesive: Either of the following construction adhesives complying with ASTM C 557.
1. Marlite C-551 FRP Adhesive - Water- resistant, non-flammable adhesive.
 2. Marlite C-915 Construction Adhesive - Flexible, water-resistant, solvent based adhesive, formulated for fast, easy application.
 3. Titebond Advanced Polymer Panel Adhesive – VOC compliant, non-flammable, environmentally safe adhesive.
- C. Sealant:
1. Marlite Brand - Color Match Sealant.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
- B. Repair defects prior to installation.
 - 1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

3.2 INSTALLATION

- A. Comply with manufacturer's recommended procedures and installation sequence.
- B. Cut sheets to meet supports allowing 1/8" (3 mm) clearance for every 8 foot (2.4m) of panel.
 - 1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.
 - 2. Pre-drill fastener holes 1/8" (3mm) oversize with high speed drill bit.
 - a. Space at 8" (200mm) maximum on center at perimeter, approximately 1" from panel edge.
 - b. Space at in field in rows 16' (40.64cm) on center, with fasteners spaced at 12" (30.48 cm) maximum on center.
- C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.
 - 1. Install panels with manufacturer's recommended gap for panel field and corner joints.
 - a. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.
 - b. Drive fasteners for snug fit. Do not over-tighten.
- D. Apply panel moldings to all panel edges using silicone sealant providing for clearances.
 - 1. All moldings must provide for a minimum 1/8 " (3mm) of panel expansion at joints and edges, to insure proper installation.
 - 2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.3 CLEANING

- A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION 097720

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Existing and new stone and clay masonry.
 - 2. Steel and iron.
 - 3. Wood.
 - 4. Plastic.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 1 gal. of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F

- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Benjamin Moore, Sherman Williams, PPP Industries
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Portland Cement Plaster: 12 percent.
 - 6. Gypsum Board: 12 percent.
- C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
- D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- H. Aluminum Substrates: Remove loose surface oxidation.
- I. Wood Substrates:
 - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

- J. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 4. Paint entire exposed surface of window frames and sashes.
 - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

- 1. Latex System MPI EXT 3.1A:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Topcoat: Latex, exterior, flat (MPI Gloss Level 1), MPI #10.
 - c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15.
 - d. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
 - e. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6), MPI #119.

B. Existing and new Stone and Clay Masonry Substrates:

- 1. Latex System MPI EXT 4.1A:
 - a. Prime Coat: Latex, exterior, matching topcoat.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15.

C. Steel and Iron Substrates:

- 1. Water-Based Light Industrial Coating System MPI EXT 5.1B:
- 2. Alkyd System MPI EXT 5.1D:
 - a. Prime Coat: Primer, alkyd, anticorrosive, for metal, MPI #79.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, flat (MPI Gloss Level 1), MPI #8.
- 3. Alkyd System MPI EXT 5.3B:
 - a. Prime Coat: Primer, galvanized, cementitious, MPI #26.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.

- c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.
- D. Wood Substrates: Wood trim, Architectural woodwork, Doors, Wood shingles siding.
 - 1. Latex over Latex Primer System MPI EXT 6.3L:
 - a. Prime Coat: Primer, latex for exterior wood, MPI #6.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15.
- E. Wood Substrates: Wood-based panel products.
 - 1. Latex over Latex Primer System MPI EXT 6.4K:
 - a. Prime Coat: Primer, latex for exterior wood, MPI #6.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15.
- F. Plastic Trim Fabrication Substrates:
 - 1. Latex System MPI EXT 6.8A:
 - a. Prime Coat: Primer, bonding, water based, MPI #17.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15.
- G. Exterior Bituminous-Coated Substrates:
 - 1. Latex System MPI EXT 10.2A:
 - a. Prime Coat: Primer, rust inhibitive, water based, MPI #107.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, flat (MPI Gloss Level 1), MPI #10.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Clay masonry.
 - 3. Concrete masonry units (CMUs).
 - 4. Steel and iron.
 - 5. Wood.
 - 6. Gypsum board.
 - 7. Plaster.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 2 gal. of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F
 - 1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Benjamin Moore, Sherman Williams, PPG Industries
- B. Products: As listed in coating schedule Item 3.5 below

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As selected by Architect from manufacturer's full range

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Fiber-Cement Board: 12 percent.

3. Masonry (Clay and CMUs): 12 percent.
 4. Wood: 15 percent.
 5. Gypsum Board: 12 percent.
 6. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- G. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Traffic Surfaces:

1. Alkyd Floor Enamel System MPI INT 3.2B:
 - a. Prime Coat: Floor enamel, alkyd, matching topcoat.
 - b. Intermediate Coat: Floor enamel, alkyd, matching topcoat.
 - c. Topcoat: Floor enamel, alkyd, gloss (MPI Gloss Level 6), MPI #27.

B. Clay Masonry Substrates:

1. Latex System MPI INT 4.1A:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.

- b. Intermediate Coat: Latex, interior, matching topcoat.
- c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

C. CMU Substrates:

1. Latex System MPI INT 4.2A:

- a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
- b. Intermediate Coat: Latex, interior, matching topcoat.
- c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

D. Wood Substrates: Wood trim, Architectural woodwork, Doors, Windows, and wood board paneling.

1. Latex over Latex Primer System MPI INT 6.3T:

- a. Prime Coat: Primer, latex, for interior wood, MPI #39.
- b. Intermediate Coat: Latex, interior, matching topcoat.
- c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

E. Gypsum Board, and Plaster Substrates:

1. Latex over Latex Sealer System MPI INT 9.2A:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Prime Coat: Latex, interior, matching topcoat.
- c. Intermediate Coat: Latex, interior, matching topcoat.
- d. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

END OF SECTION 099123

SECTION 099300 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and application of wood stains and transparent finishes on the following substrates:
 - 1. Interior Substrates:
 - a. Dressed lumber (finish carpentry or woodwork).
 - b. Wood-based panel products.
 - c. Wood floors and stairs.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of product.
- C. Samples for Verification: For each type of finish system and in each color and gloss of finish required.
 - 1. Submit Samples on representative samples of actual wood substrates, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Stains and Transparent Finishes: percent, but not less than 1 gal. of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F
- B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures less than 5 deg F above the dew point, or to damp or wet surfaces.
- C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product listed in wood finish systems schedules for the product category indicated.

2.2 MATERIALS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."
- B. Material Compatibility:
 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. Stain Colors: As selected by Architect from manufacturer's full range

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- C. Maximum Moisture Content of Interior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with finish application only after unsatisfactory conditions have been corrected.
 - 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 - 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.
 - 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 - 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- D. Interior Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
 - 3. Sand surfaces exposed to view and dust off.

4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.

3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 1. Use applicators and techniques suited for finish and substrate indicated.
 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
 3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 INTERIOR WOOD -FINISH-SYSTEM SCHEDULE

- A. Wood Substrates: Wood trim architectural woodwork doors windows and wood board paneling.
 1. Water-Based Varnish over Stain System MPI INT 6.3W:
 - a. Stain Coat: Stain, semitransparent, for interior wood, MPI #90.
 - 1) Manufacturer: Minwax
 - b. First Intermediate Coat: Water-based varnish matching topcoat.
 - c. Second Intermediate Coat: Water-based varnish matching topcoat.
 - d. Topcoat: Varnish, water based, clear, satin (MPI Gloss Level 4), MPI #128.

END OF SECTION 099300

SECTION 114000 - FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Fabricated equipment.
 - 2. Self-contained refrigeration equipment.
 - 3. Warewashing equipment.
 - 4. Utility distribution systems.

- B. Related Requirements:

- 1. Section 233813 "Commercial-Kitchen Hoods" for ventilation hoods.

1.3 COORDINATION

- A. Coordinate foodservice equipment layout and installation with other work, including layout and installation of lighting fixtures, HVAC equipment, and fire-suppression system components.
- B. Coordinate locations and requirements of utility service connections.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include the following:

- 1. Manufacturer's model number.
 - 2. Accessories and components that will be included for Project.
 - 3. Clearance requirements for access and maintenance.
 - 4. Utility service connections for water, drainage, power, and fuel; include roughing-in dimensions.

- B. Shop Drawings: For fabricated equipment. Include plans, elevations, sections, roughing-in dimensions, fabrication details, utility service requirements, and attachments to other work.

- C. Samples for Initial Selection: For units with factory-applied color finishes.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For foodservice equipment to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 1, include the following:

a. Product Schedule: For each foodservice equipment item, include the following:

- 1) Designation indicated on Drawings.
- 2) Manufacturer's name and model number.
- 3) List of factory-authorized service agencies including addresses and telephone numbers.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with foodservice equipment by field measurements before fabrication. Indicate measurements on Coordination Drawings.

1.7 WARRANTY

- A. Refrigeration Compressor Warranty: Manufacturer agrees to repair or replace compressors that fail in materials or workmanship within specified warranty period.

1. Failure includes, but is not limited to, inability to maintain set temperature.
2. Warranty Period: five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NSF Standards: Provide equipment that bears NSF Certification Mark or UL Classification Mark certifying compliance with applicable NSF standards.
- B. UL Certification: Provide electric and fuel-burning equipment and components that are evaluated by UL for fire, electric shock, and casualty hazards according to applicable safety standards, and that are UL certified for compliance and labeled for intended use.
- C. Regulatory Requirements: Install equipment to comply with the following:
1. ASHRAE 15, "Safety Code for Mechanical Refrigeration."
 2. NFPA 54, "National Fuel Gas Code."
 3. NFPA 70, "National Electrical Code."
 4. NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations."

2.2 FABRICATED EQUIPMENT

A. Stainless-Steel Sinks

1. Description: Three-compartment sink(s). Fabricate units of welded stainless steel, sound deadened.
 - a. Bowls: Stainless steel, Type 304, 0.078 inch thick.
 - b. Integral Drainboards: Stainless steel, Type 304, 0.078 inch thick.
 - c. Body: Stainless steel, Type 304, 0.078 inch thick.
 - 1) Back Splash: 13 inches
 - d. Legs and Feet: Stainless-steel tubing legs with adjustable bullet feet.
 - e. Accessories:
 - 1) Faucets and Spouts:
 - 2) Prerinse Faucet:
 - 3) Vacuum breaker.
 - 4) Lever waste with overflow.
 - 5) Basket strainer.
 - 6) Continuous waste.
 - 7) Scrap trough.
2. Stainless-Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, type as indicated.
3. Fabrication: Prepare sink for installation of the following equipment items:
 - a. Undercounter dishwasher.
4. Stainless-Steel Finish: Directional satin finish, No. 4

B. Stainless-Steel Tables:

1. Description: Flat-countertop Prep table.
 - a. Welded Undershelf: Stainless steel, Type 304, 0.050 inch thick.
 - b. Crossbracing: Stainless-steel tubing, welded to legs.
 - c. Cabinet:
 - 1) Body: Stainless steel, Type 430, 0.050 inch thick.
 - 2) Drawers: Stainless-steel drawer and faceplate
 - 3) Revise list below to suit Project.
 - 4) Faucet and Spout:
 - 5) Vacuum breaker.
 - 6) Leverwaste with overflow.
 - 7) Basket strainer.
 - 8) Tail piece.
 - d. Legs: Metallic-coated steel tubing.
 - e. Feet: Stainless-steel adjustable bullets Plastic, Casters.
2. Materials:

- a. Stainless-Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, type as indicated.
3. Stainless-Steel Finish: Directional satin finish, No. 4.
- C. Stainless-Steel Shelf Units:
 1. Description: Table mounted, double deck. Fabricate units of stainless steel, [Type 304, 0.062 inch thick.
 2. Stainless-Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, type as indicated.
 3. Stainless-Steel Finish: Directional satin finish, No. 4.
- D. Stainless-Steel Hand Sinks:
 1. Description: Lavatory sink. Fabricate units of stainless steel, Type 304, 0.050 inch thick.
 - a. Operation: Wrist handle
 - b. Faucet and Spout:
 - c. Accessories:
 - 1) Chrome-plated tail piece and P trap, NPS 1-1/2, with 0.045-inch minimum wall thickness.
 - 2) Strainer basket with metal post.
 - 3) Liquid soap dispenser, splash deck mounted.
 - 4) Towel dispenser.
 - 5) Tubular wall supports.
 2. Stainless-Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, type as indicated.
 3. Stainless-Steel Finish: Directional satin finish, No. 4
- E. Ice-Making Machine :
 1. Description: Freestanding units.
 - a. Production: Ice cubes
 - b. Capacity: 350 lb per 24-hour period.
 - c. Accessories:
 - 1) Storage Bin:
 - a) Storage Capacity: 536 lb
 - 2) Stainless-steel stand and legs.
 - 3) Water filter.
 - d. Electrical Service: Equip unit for connection to service indicated on Drawings

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install foodservice equipment level and plumb, according to manufacturer's written instructions.

1. Connect equipment to utilities.
 2. Provide cutouts in equipment, neatly formed, where required to run service lines through equipment to make final connections.
- B. Complete equipment assembly where field assembly is required.
1. Provide closed butt and contact joints that do not require a filler.
 2. Grind field welds on stainless-steel equipment until smooth and polish to match adjacent finish.
- C. Install equipment with access and maintenance clearances that comply with manufacturer's written installation instructions and with requirements of authorities having jurisdiction.
- D. Install cabinets and similar equipment on bases in a bed of sealant.
- E. Install closure-trim strips and similar items requiring fasteners in a bed of sealant.
- F. Install joint sealant in joints between equipment and abutting surfaces with continuous joint backing unless otherwise indicated. Produce airtight, watertight, vermin-proof, sanitary joints.

3.2 CLEANING AND PROTECTING

- A. After completing installation of equipment, repair damaged finishes.
- B. Clean and adjust equipment as required to produce ready-for-use condition.
- C. Protect equipment from damage during remainder of the construction period.

4. EQUIPMENT SCHEDULE – SEE ATTACHMENT

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading and foundation waterproofing
2. Preparing subgrades and provision of base course for pavements as Alternate Two
3. Excavating, shoring and sheeting, preparation of subgrade for foundations and slabs, drainage course for slabs, and backfilling for North Driveway Replacement Walls, Ramp, Stairs as Alternate Three
4. Excavating and backfilling trenches and pads for utilities and pits for buried utility structures and equipment.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct preexcavation conference at project site

1.4 INFORMATIONAL SUBMITTALS

- A. Material test reports.

1.5 FIELD CONDITIONS

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.
- B. Do not commence earth-moving operations until plant-protection measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Provide shoring, sheeting and bracing to protect existing structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 SUBGRADE INSPECTION

- A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi may be used when approved by Architect.
 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033053 "Miscellaneous Cast-in-Place Concrete."

- D. Trenches under Roadways: Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033053 "Miscellaneous Cast-in-Place Concrete."
- E. Initial Backfill: Place and compact initial backfill of subbase material free of particles larger than one inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Final Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Warning Tape: Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.

3.11 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at **95** percent.
 - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
 - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 - 4. For utility trenches, compact each layer of initial and final backfill soil material at **85** percent.

3.13 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch
 - 2. Walks: Plus or minus 1 inch
 - 3. Pavements: Plus or minus 1/2 inch
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 - 1. Shape subbase course and base course to required crown elevations and cross-slope grades.
 - 2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698

3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick
 - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than **95** percent of maximum dry unit weight according to ASTM D 698.

3.16 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform inspections:
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Hot-mix asphalt paving.
 - 2. Asphalt surface treatments.
- B. Related Requirements:
 - 1. Section 024119 "Selective Demolition" for demolition and removal of existing asphalt pavement.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
 - 2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
 - 3. Job-Mix Designs: For each job mix proposed for the Work.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of state or DOT for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 1. Prime Coat: Minimum surface temperature of 60 deg F
 2. Tack Coat: Minimum surface temperature of 60 deg F
 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
 4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- C. Fine Aggregate: ASTM D 1073 sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D 242/D 242M, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: ASTM D 6373 binder designation PG 64-22.
- B. Asphalt Cement: ASTM D 3381/D 3381M for viscosity-graded material or ASTM D 946/D 946M for penetration-graded material.
- C. Cutback Prime Coat: ASTM D 2027/D 2027M, medium-curing cutback asphalt, MC-70.
- D. Emulsified Asphalt Prime Coat: ASTM D 977 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

- E. Tack Coat: ASTM D 977 emulsified asphalt, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- F. Water: Potable.
- G. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

2.3 AUXILIARY MATERIALS

- A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires, asphalt shingles, or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.
- B. Sand: ASTM D 1073, Grade No. 2 or No. 3.
- C. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
- D. Joint Sealant: ASTM D 6690, Type I, hot-applied, single-component, polymer-modified bituminous sealant.

2.4 MIXES

- 1. Surface Course Limit: Recycled content no more than 10 percent by weight.
- B. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
- C. Emulsified-Asphalt Slurry: ASTM D 3910, Type 1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.

- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph
 - 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons
 - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

3.3 SURFACE PREPARATION

- A. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 PAVING GEOTEXTILE INSTALLATION

- A. Apply tack coat uniformly to existing pavement surfaces at a rate of 0.20 to 0.30 gal./sq. yd.
- B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches and transverse joints 6 inches
- C. Protect paving geotextile from traffic and other damage, and place hot-mix asphalt overlay the same day.

3.5 PLACING HOT-MIX ASPHALT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 - 2. Place hot-mix asphalt surface course in single lift.
 - 3. Spread mix at a minimum temperature of 250 deg F
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
 - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 in from strip to strip to ensure proper compaction of mix along longitudinal joints.
 - 2. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches
 - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
 - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.7 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 - 1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927, but not less than 94 percent or greater than 100 percent.
 - 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041/D 2041M, but not less than 90 percent or greater than 96 percent.

- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2 inch
 - 2. Surface Course: Plus 1/4 inch , no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: 1/4 inch
 - 2. Surface Course: 1/8 inch
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch
- C. Asphalt Traffic-Calming Devices: Compact and form asphalt to produce the contour indicated and within a tolerance of plus or minus 1/8 inch of height indicated above pavement surface.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549/D 3549M.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. Asphalt Traffic-Calming Devices: Finished height of traffic-calming devices above pavement will be measured for compliance with tolerances.

- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979/D 979M or AASHTO T 168.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041/D 2041M, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726/D 2726M.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than three cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726/D 2726M.
- F. Replace and compact hot-mix asphalt where core tests were taken.
- G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.10 WASTE HANDLING

- A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 321216

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. These basic requirements apply to all Division 22000 Sections.
- B. The work of this Section consists of providing of all materials, labor and equipment and the like necessary and/or required for the complete execution of all Plumbing and related work for this project, as required by the contract documents.

1.02 RELATED SECTIONS

- A. Refer to Division 1 Specification.

1.03 REFERENCES

- A. ASHRAE – American Society of Heating, Refrigerating and Air Conditioning Engineers Guides and Standards, latest editions.
- B. ASPE - American Society of Plumbing Engineers.
- C. UL - Underwriters Laboratory.
- D. NFPA - National Fire Protection Association.

1.04 REGULATORY REQUIREMENTS

- A. Conform to New York City Building Code as well as all local codes.
- B. Plumbing: Conform to New York State U.F.P.B.C.
- C. Obtain permits, and request inspections from authority having jurisdiction.

1.05 QUALITY ASSURANCE

- A. The Contractor shall have the work indicated on the drawings and/or specified in each section performed by vendors or mechanics experienced and skilled in its implantation or by a “Specialist”, “Specialty Contractor” or “Specialty Subcontractor” under contractual agreement with the Contractor. These terms mean an individual or firm of established reputation, or, if newly organized, whose personnel have previously established a reputation in the same field, which is regularly engaged in, and which maintains a regular force of workmen skilled in either manufacturing or fabricating items required by the Contract, installing items required by the Contract, or otherwise performing work required by the Contract.

- B. Where the Contract Specifications require installation by a "Specialist," that term shall also be deemed to mean either the manufacturer of the item, an individual or firm licensed by the manufacturer, or an individual or firm who will perform such work under the manufacturer's direct supervision.

1.06 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed arrangement of Work to meet Project conditions, including changes to Work specified in other Sections.

1.07 SCOPE OF WORK

- A. This Contractor shall be responsible for coordinating his work with all other trades.
- B. The Contractor shall provide all materials, labor, equipment, tools, appliances, services, hoisting, scaffolding, supervision and overhead for the furnishing and installing of all mechanical work and related work including but not limited to the following:
- Demolition of plumbing piping and equipment
 - Domestic hot and cold water piping, valves and specialties
 - Gas piping, valves and specialties
 - Sanitary waste and vent piping, valves and specialties
 - New fixture and specialties
 - Pipe and equipment insulation
 - Hangers/Supports
 - Identification
 - Coordination
 - Phasing
 - Shop Drawings
 - As-Built Drawings and Maintenance Manuals
 - Warrantees

PART 2 PRODUCTS

2.01 GENERAL

- A. Construct all apparatus of materials and pressure ratings suitable for the conditions encountered during continuous operation.
- B. Where corrosion can occur, appropriate corrosion resistant materials and assembly methods must be used including isolation of dissimilar metals against galvanic interaction. Resistance to corrosion must be achieved by the use of the appropriate base materials. Coatings shall be restored to only when specifically permitted by the Specification.
- C. Construct all equipment in accordance with requirements of all applicable codes. All pressure vessels and safety devices that fall within the scope of the ASME Code shall conform to the Code and bear the ASME label or stamp.

- D. Match and balance all system components to achieve compatibility of equipment or satisfactory operation and performance throughout the entire operating temperature and control ranges. All installations shall be in accordance with manufacturer's recommendations.
- E. The contractor shall warranty all work, including labor and materials, and equipment furnished and installed as part of this contract for a minimum period of year from the date of acceptance by the owner, in writing. Certain equipment, such as underground fuel tanks, may have longer warranties as indicated in the specifications. In such cases the longer of the two warranties shall prevail.

2.02 SHOP DRAWINGS AND SUBMITTALS (COORDINATE WITH DIVISION 1)

- A. Shop drawings and samples shall be prepared and submitted in accordance with the requirements established in the contract and shall consist of the all items listed in the following paragraph.
- B. Manufacturer's data or shop drawings giving full information as to dimensions, materials, and all information pertinent to the adequacy of the submitted equipment shall be submitted for review. Shop drawings shall include, but not be limited to the following:
 - Domestic hot and cold water piping, valves and specialties
 - Gas piping, valves and specialties
 - Sanitary waste and vent piping, valves and specialties
 - New fixture and specialties
 - Pipe and equipment insulation
 - Hangers/Supports
 - Identification
 - As-Built Drawings and Maintenance Manuals
 - Warrantees
- C. The contractor shall, upon award, submit a schedule for the engineers review indicating when each of the above shop drawings shall be submitted. Submittals shall be made in a timely manor as the project progresses in accordance with the Construction manager or General contractor's work schedules. The contractor shall allow sufficient time for the engineers to perform his review. A minimum of 10 business days shall be required. Untimely submittals shall be cause for the owner to make a delay against the contractor.
- D. Demolition, purchase and or installation shall not begin until shop drawings pertaining to the equipment associated with any related potion of the work have been submitted.
- E. Coordination shop drawings shall indicate all existing and/or new lights, walls, piping, ductwork, structural elements, existing work, etc. and dimension locations of plumbing piping including elevations in relation to these items.
- F. Where shop drawings have been reviewed by the Engineer, such review shall not be considered as a guarantee of measurements or building conditions. Where drawings have

been reviewed, said review does not mean that drawings have been checked in detail; said review does not substantiate any quantities and in any way relieve the Contractor from his responsibility nor the necessity of furnishing materials or performing work required by the Contract Drawings and Specifications.

- G. The Contractor shall be specifically responsible for checking dimensions and clearances and confirming that roof drains will connect properly to the new roof and/or materials.
- H. Drawings marked "Make Corrections Noted" give authority to proceed in accordance with the notes. However, if drawings are also marked "Resubmit", corrected drawings must be resubmitted for final review.
- I. Drawings marked "Rejected" do not give authority to proceed with any portion of the work shown there-on. Drawings must be resubmitted.

2.03 CHARTS AND TAGS

- A. The Contractor shall provide three sets of charts and diagrams of all piping systems indicating the number and location of valves, etc.
- B. All valves shall be designated with brass tags.
- C. Comply with Division 1.

2.04 CODES AND STANDARDS

- A. All equipment and installation methods shall conform to the applicable standards and/or recommendations set forth in the NEW YORK STATE PLUMBING AND FUEL GAS AND BUILDING CodeS.

2.05 FEES & PERMITS

- A. The Contractor shall obtain all permits and pay all fees required for his work.

2.06 PAINTING

- A. All piping shall be painted in colors conforming with OSHA Standards.

2.07 CUTTING AND PATCHING

- A. All cutting and patching required for piping, etc., passing through walls, floors, and roof shall be provided by the General Contractor under this contract unless otherwise noted. This Contractor shall be responsible for any damage done to the structure due to his negligence.
- B. Patching materials and application shall match existing construction.
- C. Where applicable, new holes for piping installation shall be core drilled.
- D. Pipe Sleeves & Fire-stopping

1. Provide for all pipes and other elements passing through floors, walls, partitions and structural elements, sleeves as specified. Sleeves shall be of adequate diameter to allow for a minimum of 3/4 inches clear all around sleeve and pipe.
2. Where pipes penetrate fire rated assemblies, or where holes or voids are created to extend systems through fire rated assemblies (walls, floors, ceilings, structure, etc.); sleeves and fire-stopping systems shall be installed.

2.08 PROTECTION-COORDINATE WITH DIVISION 1

- A. Recommendations and Provisions of ANSI Bulletin A10.2 and OSHA shall be complied with in-so-far as applicable to the work.
- C. The Contractor shall provide temporary partitions or tarpaulins to protect adjacent spaces and/or equipment. He shall be responsible for any damage or injury to person or property of any character resulting from any act, omission, neglect or misconduct in his manner or method of executing his work.
- D. The Contractor shall restore at his own expense such property to a condition similar or equal to that existing before such damage or injury in an acceptable manner.
- E. The Contractor, furthermore, shall conduct his operations in such a manner as to prevent dust and debris from transferring on to adjoining property or into existing spaces.
- F. All openings cut in walls, floors, roof or ceilings of the building, for pipe, etc., shall be closed off with box-type temporary protective enclosures of 1/4" tempered hardboard, except when mechanics are actually working at the particular opening. Enclosures shall be constructed of fireproof 2x4 frame, four (4) sides covered and made completely dust and water tight.
- G. All finished floor areas through which the contractor must pass with materials or equipment shall be protected with a layer of 1/4" hardboard, "Masonite", laid with joints taped together.

2.09 WELDING

- A. Welding and equipment shall conform to the American Welding Society's Code for Welding in Building Construction, latest edition as well as state and local laws and ordinances.
- B. The handling and storage of all welding materials, acetylene and oxygen tanks, burners, and other equipment required for the execution of welding and cutting work shall be subject at all times to the approval of the Owner and/or Architect. All welding materials and gas tanks shall be promptly removed from the premises upon completion of each day's work or stored in a manner satisfactory to the owner. Welding and equipment shall conform to the American Welding Society's Code for Welding in Building Construction, latest edition as well as state and local laws and ordinances.

2.10 AS-BUILT DRAWINGS

- A. The Contractor shall provide a complete set of As-Built drawings showing actual installation and locations of all piping and roof drains.

- B. As-Built drawings shall be submitted as per contract requirements in accordance with Division 1.

PART 3 EXECUTION

3.01 CONDITIONS

- A. Inspection: Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Verify that the work of this Section may be completed in strict accordance with all pertinent codes and regulations, the approved Shop Drawings, and the Manufacturers' recommendations.
- B. Discrepancies: In the event of discrepancy, immediately notify the Engineer. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 CLOSING-IN OF UNINSPECTED WORK

- A. General: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and accepted by the Engineer and by all other authorities having jurisdiction.
- B. Uncovering: Should any of the work of this Section be covered up or enclosed before it has been completely inspected, tested, and approved, do all things necessary to uncover all such work. After the work has been completely inspected, tested, and approved, provide all materials and labor necessary and make all repairs necessary to restore the work to its original and proper condition at no additional cost to the owner.

3.03 BUILDING ACCESS

- A. The Contractor shall inform himself fully regarding peculiarities and limitations of space available for the passage and installation of all equipment and materials under the Contract.
- B. Verify and coordinate removal of existing construction to suit conditions. Provide all labor and material to facilitate installation.

3.04 COOPERATION WITH OTHER TRADES / PHASING

- A. Cooperate with other trades in order that all systems in the work may be installed in the best arrangements.
- D. Coordinate as required with all other trades to share space in common areas and to provide the maximum of access to each system.
- E. This Contractor shall submit fully coordinated shop drawings showing all piping, ductwork and equipments, as well as relevant work of all other trades such as light, conduits, structural and steel, which may impact the final size or placement of piping, roof drains, etc.

- F. The work shall be scheduled and phased in accordance with the requirements of the contract and the client. Prior to the commencement of work, the Plumbing contractor shall submit a schedule in writing to the Architect and owner for approval. There shall be no shut downs of any systems without prior written approval from the owner. The contractor shall include in his bid all costs associated with providing temporarily piping, pumps, hot water heaters, to maintain operations in the phase II area while work is being performed on the Phase I area. It shall also be noted that piping will have to be extended through the phase II work areas in order to reach the area(s) under construction in phase I as part of this work. The contractor shall include in his bid all provisions to perform such phasing work. This note is typical for additional phases.

3.05 CLEANING

- A. It is the intent of the contract documents that all work, including the inside of equipment be left in a clean condition. All construction dirt shall be removed from material and equipment.
- B. All removed items shall be taken off the premises and discarded in a manner satisfactory to the Owner.

3.06 COMPLETENESS

- A. It is the intent of the contract documents to provide complete systems. Completeness shall mean not only that all material and equipment has been installed properly, but that all material and equipment is installed, adjusted, and operating as per the design intent in the opinion of the Engineer.

END OF SECTION

SECTION 22 05 23
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Iron, single-flange butterfly valves.
3. Iron, grooved-end butterfly valves.
4. Bronze lift check valves.
5. Bronze swing check valves.
6. Bronze gate valves.
7. Iron gate valves.
8. Bronze globe valves.
9. Iron globe valves.
10. Lubricated plug valves.

B. Related Sections:

1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
3. Division 33 water distribution piping Sections for general-duty and specialty valves for site construction piping.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.

1.4 SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 2. ASME B31.1 for power piping valves.
 - 3. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set gate valves closed to prevent rattling.
 - 4. Set ball valves open to minimize exposure of functional surfaces.
 - 5. Set butterfly valves closed or slightly open.
 - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.

- D. Valve Actuator Types:
 - 1. Handwheel: For valves other than quarter-turn types.
 - 2. Handlever: For quarter-turn valves NPS 6 and smaller.
- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 - 1. Gate Valves: With rising stem.
 - 2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 3. Butterfly Valves: With extended neck.
- F. Valve-End Connections:
 - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 - 2. Grooved: With grooves according to AWWA C606.
 - 3. Solder Joint: With sockets according to ASME B16.18.
 - 4. Threaded: With threads according to ASME B1.20.1.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

- A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:
 - 1. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Forged brass.
 - f. Seats: PTFE or TFE.
 - g. Stem: Brass.
 - h. Ball: Chrome-plated brass.
 - i. Port: Full.
- B. Two-Piece, Regular-Port, Brass Ball Valves with Brass Trim:
 - 1. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Forged brass.
 - f. Seats: PTFE or TFE.
 - g. Stem: Brass.
 - h. Ball: Chrome-plated brass.
 - i. Port: Regular.

2.3 IRON BODY, SINGLE-FLANGE BUTTERFLY VALVES

- A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM or NBR Seat and Aluminum-Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Jenkins Valves.
 - b. Crane Co.; Crane Valve Group; Stockham Division.
 - c. NIBCO INC.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 2. Description:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
 - e. Seat: EPDM or NBR.
 - f. Stem: One- or two-piece stainless steel.
 - g. Disc: Aluminum bronze.

2.4 IRON BODY, GROOVED-END BUTTERFLY VALVES

- A. 175 CWP, Iron, Grooved-End Butterfly Valves:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Kennedy Valve; a division of McWane, Inc.
 - b. Shurjoint Piping Products.
 - c. Tyco Fire Products LP; Grinnell Mechanical Products.
 - d. Victaulic Company.
 2. Description:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 175 psig.
 - c. Body Material: Coated, ductile iron.
 - d. Stem: Two-piece stainless steel.
 - e. Disc: Coated, ductile iron.
 - f. Seal: EPDM.

2.5 BRONZE LIFT CHECK VALVES

- A. Class 125, Lift Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
2. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Vertical flow.
 - d. Body Material: ASTM B 61 or ASTM B 62, bronze.
 - e. Disc: Bronze.

2.6 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Disc: Bronze.

2.7 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Milwaukee Valve Company.

- e. NIBCO INC.
- f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-80, Type 1.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
- d. Ends: Threaded or solder joint.
- e. Stem: Bronze.
- f. Disc: Solid wedge; bronze.
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 125, RS Bronze Gate Valves:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Hammond Valve.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 2. Description:
 - a. Standard: MSS SP-80, Type 2.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded or solder joint
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.

2.8 IRON BODY GATE VALVES

A. Class 125, OS&Y, Iron Gate Valves:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Milwaukee Valve Company.

- e. NIBCO INC.
- f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-70, Type I.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM A 126, gray iron with bolted bonnet.
- d. Ends: Flanged.
- e. Trim: Bronze.
- f. Disc: Solid wedge.
- g. Packing and Gasket: Asbestos free.

B. Class 250, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Crane Co.; Crane Valve Group; Stockham Division.
- c. Milwaukee Valve Company.
- d. NIBCO INC.
- e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-70, Type I.
- b. CWP Rating: 500 psig.
- c. Body Material: ASTM A 126, gray iron with bolted bonnet.
- d. Ends: Flanged.
- e. Trim: Bronze.
- f. Disc: Solid wedge.
- g. Packing and Gasket: Asbestos free.

2.9 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Crane Co.; Crane Valve Group; Stockham Division.
- c. Milwaukee Valve Company.
- d. NIBCO INC.
- e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-80, Type 1.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
- d. Ends: Threaded or solder joint.
- e. Stem: Bronze.
- f. Disc: Bronze, PTFE, or TFE
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron, bronze, or aluminum.

2.10 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 2. Description:
 - a. Standard: MSS SP-85, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Packing and Gasket: Asbestos free.

2.11 LUBRICATED PLUG VALVES

A. Class 125, Cylindrical, Lubricated Plug Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Homestead Valve; a division of Olson Technologies, Inc.
 - b. Milliken Valve Company.
 - c. R & M Energy Systems; a unit of Robbins & Myers, Inc.
- 2. Description:
 - a. Standard: MSS SP-78, Type IV.
 - b. CWP Rating: 200 psig.

- c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
- d. Plug: Cast iron or bronze with sealant groove.
- e. Ends: threaded or flanged

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
1. Shutoff Service: Ball, butterfly, or gate valves.
 2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
 3. Throttling Service: Globe or ball valves.
 4. Pump-Discharge Check Valves:
 - a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
 - b. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
 4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 5. For Grooved-End Copper Tubing and Steel Piping: Valve ends may be grooved.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
1. Brass Valves: May be provided with solder-joint ends instead of threaded ends.
 2. Ball Valves: Two piece, full port, brass with brass trim.
 3. Bronze Swing Check Valves: Class 125, bronze disc.
 4. Bronze Gate Valves: Class 125.
- B. Pipe NPS 2-1/2 and Larger:
1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
 2. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM, NBR seat, aluminum-bronze disc.
 3. Iron, Grooved-End Butterfly Valves: 175 CWP.
 4. Iron Gate Valves: Class 125.

3.6 SANITARY WASTE AND STORM-DRAINAGE VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.

2. Bronze Swing Check Valves: Class 125, nonmetallic disc.
3. Bronze Gate Valves: Class 125.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron Gate Valves: Class 125.
3. Iron Swing Check Valves: Class 125.
4. Iron Globe Valves: Class 125.

END OF SECTION 220523

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe stands.
6. Pipe positioning systems.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 fire-suppression piping Sections for pipe hangers for fire-suppression piping.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Trapeze pipe hangers.
 - 2. Metal framing systems.
 - 3. Fiberglass strut systems.
 - 4. Pipe stands.
- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of trapeze hangers.
 - 2. Design Calculations: Calculate requirements for designing trapeze hangers.
- D. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel or stainless steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. National Pipe Hanger Corporation.
 - 2. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
 - 3. Rilco Manufacturing Co., Inc.
 - 4. Other manufacturers offering equivalent products.
- B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

- C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand:
 - 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
 - 2. Base: Stainless steel.
 - 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
 - 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand:
 - 1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
 - 2. Bases: One or more; plastic.
 - 3. Vertical Members: Two or more protective-coated-steel channels.
 - 4. Horizontal Member: Protective-coated-steel channel.
 - 5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

2.6 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe Stand Installation:
 - 1. Pipe Stand: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
- F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.
- G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, **NPS 2-1/2** and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:

1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.5 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports, and metal trapeze pipe hangers and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
 19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types: Note that all plumbing piping connected to motor driven equipment, pumps, compressors etc. shall be hung with vibration isolation hanger for the first 25' from the equipment.
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- Q. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Warning signs and labels.
 - 2. Pipe labels.
 - 3. Stencils.
 - 4. Valve tags.
 - 5. Warning tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Black.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.3 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.
 - 1. Stencil Paint: Exterior, gloss, black unless otherwise indicated. Paint may be in pressurized spray-can form.
 - 2. Identification Paint: Exterior, enamel in colors according to ASME A13.1 unless otherwise indicated.

2.4 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 - 1. Size: 3 by 5-1/4 inches minimum.
 - 2. Fasteners: Brass grommet and wire.
 - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Interior Painting."
- B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles on each piping system.
 - 1. Identification Paint: Use for contrasting background.
 - 2. Stencil Paint: Use for pipe marking.
- C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.3 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 - 1. Valve-Tag Size and Shape:
 - a. Cold Water: 1-1/2 inches round.
 - b. Hot Water: 1-1/2 inches round.
 - 2. Valve-Tag Color:
 - a. Cold Water: Green.
 - b. Hot Water: Green.
 - 3. Letter Color:
 - a. Cold Water: White.
 - b. Hot Water: White.

C. 3.03 SCHEDULE

1. Provide valve chart and schedule minimum of 8.5" x 11" in aluminum frame with clear laminate face. Install in the boiler room or at location as directed by the facilities. Indicate Valve #, size, Service and N.O. or N.C.

VALVE TAG SCHEDULE			
No.	size	Service	N.O./N.C.

2. The chart shall contain all new and existing boiler plant and related systems valves, new or existing. Including; steam condensate, and CW make up, fuel oil and drain

3.4 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic cold-water piping.
 - 2. Domestic hot-water piping.
 - 3. Domestic recirculating hot-water piping.
 - 4. Sanitary waste piping exposed to freezing conditions.
 - 5. Storm-water piping exposed to freezing conditions.
 - 6. Roof drains and rainwater leaders.
 - 7. Supplies and drains for handicap-accessible lavatories and sinks.
- B. Related Sections:
 - 1. Section 220719 "Plumbing Equipment Insulation."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at pipe expansion joints for each type of insulation.
 - 3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 4. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - 5. Detail application of field-applied jackets.
- C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:
 - 1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
 - 2. Jacket Materials for Pipe: 12 inches long by NPS 2.

3. Sheet Jacket Materials: 12 inches square.
4. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- C. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for

installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pittsburgh Corning Corporation; Foamglas.
 - 2. Block Insulation: ASTM C 552, Type I.
 - 3. Special-Shaped Insulation: ASTM C 552, Type III.
 - 4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 - 5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
 - 6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Aeroflex USA, Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
 - H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; SoftTouch Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Friendly Feel Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; SOFTR All-Service Duct Wrap.
 - I. Mineral-Fiber, Preformed Pipe Insulation:
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000-Degree Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- 2.2 INSULATING CEMENTS
- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ramco Insulation, Inc.; Super-Stik.
 - B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ramco Insulation, Inc.; Thermokote V.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Aeroflex USA, Inc.; Aeroseal.

- b. Armacell LLC; Armaflex 520 Adhesive.

- c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.

- d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.

- b. Eagle Bridges - Marathon Industries; 225.

- c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.

- d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
 - d. Mon-Eco Industries, Inc.; 22-25.
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- F. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 739, Dow Silicone.
 - b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
 - c. P.I.C. Plastics, Inc.; Welding Adhesive.
 - d. Speedline Corporation; Polyco VP Adhesive.
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass and Phenolic Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Pittsburgh Corning Corporation; Pittseal 444.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.

4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
 - d. Mon-Eco Industries, Inc.; 44-05.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.
 - 2. Adhesive: As recommended by jacket material manufacturer.
 - 3. Color: White.
 - 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. Metal Jacket:
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
 - b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
 - c. RPR Products, Inc.; Insul-Mate.
 - 2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Sheet and roll stock ready for shop or field sizing.
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
 - d. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.

- 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- D. Underground Direct-Buried Jacket: 125-mil- thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pittsburgh Corning Corporation; Pittwrap.
 - b. Polyguard Products, Inc.; Insulrap No Torch 125.
- E. EXTERIOR APPLICATIONS:
 1. Insulation Type A thickness as scheduled with ASJ vapor barrier jacket - Cover factory interior jacket with Alumaguard 60 - .06" foil faced rubberized bitumen membrane designed specifically to be installed over insulation on exterior piping, tanks, vessels, and equipment. The membrane shall be 'peel and stick', self-healing if punctured, UV stable, and will expand and contract with the mechanical system. All seams shall be sealed water tight. Permeability .0053 perm

2.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABI, Ideal Tape Division; 428 AWF ASJ.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - c. Compac Corporation; 104 and 105.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABI, Ideal Tape Division; 491 AWF FSK.

- b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - c. Compac Corporation; 110 and 111.
 - d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABI, Ideal Tape Division; 370 White PVC tape.
 - b. Compac Corporation; 130.
 - c. Venture Tape; 1506 CW NS.
 2. Width: 2 inches.
 3. Thickness: 6 mils.
 4. Adhesion: 64 ounces force/inch in width.
 5. Elongation: 500 percent.
 6. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABI, Ideal Tape Division; 488 AWF.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - c. Compac Corporation; 120.
 - d. Venture Tape; 3520 CW.
 2. Width: 2 inches.
 3. Thickness: 3.7 mils.
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch in width.

2.8 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. ITW Insulation Systems; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping and Seals.
- 2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
 - 3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.9 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
 - b. McGuire Manufacturing.
 - c. Truebro; a brand of IPS Corporation.
 - d. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
- 2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Truebro; a brand of IPS Corporation.
 - b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
- 2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
- 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- O. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.

- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated):
Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 - 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
 - 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 FINISHES

- A. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- B. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1-1/2 and Smaller: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Flexible Elastomeric: 1-1/2 inch thick.
 - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
2. NPS 2 and Larger: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Flexible Elastomeric: 1-1/2 inch thick.
 - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. NPS 1-1/2 and Smaller: Insulation shall be one of the following:
 - a. Cellular Glass: 1 inch thick.
 - b. Flexible Elastomeric: 1 inch thick.
 - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 2 and Larger: Insulation shall be one of the following:
 - a. Cellular Glass: 2 inches thick.
 - b. Flexible Elastomeric: 2 inches thick.
 - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inch thick.

C. Stormwater and Overflow:

1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Flexible Elastomeric: 1 inch thick.
 - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

D. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Flexible Elastomeric: 1 inch thick.
 - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. ASJ.

D. Piping, Exposed:

1. All exposed piping and fittings shall be completely covered with ASJ AND white Zeston 2000 PVC insulated piping and fitting covers. Apply as per manufacturer with perma weld adhesive.

3.15 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. ALL exterior piping insulation shall have factory applied all service jacket covered as per specification section 2.6 E.

END OF SECTION 220719

SECTION 22 11 14
FACILITY NATURAL-GAS AND PROPANE GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, tubes, and fittings.
 - 2. Piping specialties.
 - 3. Piping and tubing joining materials.
 - 4. Valves.
 - 5. Pressure regulators.
 - 6. Concrete bases.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
 - 1. Piping and Valves: 100 psig minimum unless otherwise indicated.
 - 2. Service Regulators: 100 psig minimum unless otherwise indicated.
- B. Natural-Gas System Pressure within Buildings: 0.5 psig or less.

1.5 SUBMITTALS

- A. Product Data: For each type of the following:

1. Piping valves and specialties.
 2. Corrugated, stainless-steel tubing with associated components.
 3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
 4. Pressure regulators. Indicate pressure ratings and capacities.
 5. Dielectric fittings.
- B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
1. Shop Drawing Scale: 3/8 inch per foot.
 2. Detail mounting, supports, and valve arrangements for pressure regulator assembly.
- C. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.
- D. Qualification Data: For qualified professional engineer.
- E. Welding certificates.
- F. Field quality-control reports.
- G. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.
- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.8 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:
 - 1. Notify Construction Manager and Owner no fewer than one week in advance of proposed interruption of natural-gas service.
 - 2. Do not proceed with interruption of natural-gas service without Construction Manager's and Owner's written permission.

1.9 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Division 08 Section "Access Doors and Frames."
- C. Part 2 specifies general descriptions and minimum standards for pipe valves and fitting. All pipes valves fittings and specialties shall meet the requirements of the local utility and shall be listed and approved for use by the local utility.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 - 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 - 4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Threaded or butt welding to match pipe.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.

- e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
- 5. Mechanical Couplings:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Dresser Piping Specialties; Division of Dresser, Inc.
 - 2) Smith-Blair, Inc.
 - 3) Other manufacturers offering similar products.
 - b. Steel flanges and tube with epoxy finish.
 - c. Buna-nitrile seals.
 - d. Steel bolts, washers, and nuts.
 - e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
 - f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

- 1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
- 2. Corrugated stainless-steel tubing with polymer coating.
- 3. Operating-Pressure Rating: 0.5 psig.
- 4. End Fittings: Zinc-coated steel.
- 5. Threaded Ends: Comply with ASME B1.20.1.
- 6. Maximum Length: 72 inches.

B. Y-Pattern Strainers:

- 1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
- 2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
- 3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
- 4. CWP Rating: 125 psig.

C. Basket Strainers:

- 1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
- 2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
- 3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
- 4. CWP Rating: 125 psig.

- D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 MANUAL GAS SHUTOFF VALVES

- A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.
- B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
 - 1. CWP Rating: 125 psig.
 - 2. Threaded Ends: Comply with ASME B1.20.1.
 - 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 - 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
 - 6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
- C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.
 - 1. CWP Rating: 125 psig.
 - 2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
 - 3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 4. Service Mark: Initials "WOG" shall be permanently marked on valve body.
- D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BrassCraft Manufacturing Company; a Masco company.
 - b. Conbraco Industries, Inc.; Apollo Div.
 - c. Lyall, R. W. & Company, Inc.
 - d. McDonald, A. Y. Mfg. Co.

- e. Perfection Corporation; a subsidiary of American Meter Company.
 - 2. Body: Bronze, complying with ASTM B 584.
 - 3. Ball: Chrome-plated bronze.
 - 4. Stem: Bronze; blowout proof.
 - 5. Seats: Reinforced TFE; blowout proof.
 - 6. Packing: Threaded-body packnut design with adjustable-stem packing.
 - 7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 8. CWP Rating: 600 psig.
 - 9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 - 10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- E. Bronze Plug Valves: MSS SP-78.
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lee Brass Company.
 - b. McDonald, A. Y. Mfg. Co.
 - c. .
 - 2. Body: Bronze, complying with ASTM B 584.
 - 3. Plug: Bronze.
 - 4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 5. Operator: Square head or lug type with tamperproof feature where indicated.
 - 6. Pressure Class: 125 psig.
 - 7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 - 8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- F. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. McDonald, A. Y. Mfg. Co.
 - b. Mueller Co.; Gas Products Div.
 - c. Xomox Corporation; a Crane company.
 - 2. Body: Cast iron, complying with ASTM A 126, Class B.
 - 3. Plug: Bronze or nickel-plated cast iron.
 - 4. Seat: Coated with thermoplastic.
 - 5. Stem Seal: Compatible with natural gas.
 - 6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 7. Operator: Square head or lug type with tamperproof feature where indicated.

8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 AUTOMATIC GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33. and UL listed guide #YRPV2.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves where indicated. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
5. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
6. Body; Aluminum
7. Seals and disc; NBR
8. Core tube; 305 stainless steel
9. Core and plugnut; 430F stainless
10. Springs; 302 stainless
11. Valves shall be normally closed, cable operated and held open. Coordinate operating mechanism with fire protection contractor and equipment. Mechanism shall be designed to close valve when cable is pulled or released as required

B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38. and UL listed guide #YRPV2.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves where indicated.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.
5. Body; Aluminum
6. Seals and disc; NBR
7. Core tube; 305 stainless steel
8. Core and plugnut; 430F stainless
9. Springs; 302 stainless
10. Valves shall be normally closed, cable operated and held open. Coordinate operating mechanism with fire protection contractor and equipment. Mechanism shall be designed to close valve when cable is pulled or released as required.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.

4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.
- B. Service Pressure Regulators: Comply with ANSI Z21.80.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. American Meter Company.
 - b. Fisher Control Valves and Regulators; Division of Emerson Process Management.
 2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
 3. Springs: Zinc-plated steel; interchangeable.
 4. Diaphragm Plate: Zinc-plated steel.
 5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
 6. Orifice: Aluminum; interchangeable.
 7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
 8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
 9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
 10. Overpressure Protection Device: Factory mounted on pressure regulator.
 11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
 12. Maximum Inlet Pressure: 100 psig.

2.7 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Hart Industries International, Inc.
 - d. McDonald, A. Y. Mfg. Co.
 - e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - f. Wilkins; a Zurn company.
 2. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 125 psig minimum at 180 deg F.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Matco-Norca, Inc.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - e. Wilkins; a Zurn company.
2. Description:
 - a. Standard: ASSE 1079.
 - b. Factory-fabricated, bolted, companion-flange assembly.
 - c. Pressure Rating: 125 psig minimum at 180 deg F.
 - d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
2. Description:
 - a. Nonconducting materials for field assembly of companion flanges.
 - b. Pressure Rating: 150 psig.
 - c. Gasket: Neoprene or phenolic.
 - d. Bolt Sleeves: Phenolic or polyethylene.
 - e. Washers: Phenolic with steel backing washers.

2.8 LABELING AND IDENTIFYING

- A. In accordance with ASME and Local utility requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. Inspect natural-gas piping according to NFPA 54 and the New York State Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.
- C. Comply with NFPA 54 and the New York State Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and Con Edison requirements for installation and purging of natural-gas piping.
- B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.
 - 1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.
- C. Install fittings for changes in direction and branch connections.
- D. Install pressure gage upstream and downstream from each service regulator. Pressure gages are specified in Division 23 Section "Meters and Gages for HVAC Piping."

3.4 INDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the New York State Fuel Gas Code for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.

- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Verify final equipment locations for roughing-in.
- K. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- L. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-regulator outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- M. Extend relief vent connections for service regulators to outdoors and terminate with weatherproof vent cap.
- N. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- O. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
 - 1. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
 - a. Exception: Tubing passing through partitions or walls does not require striker barriers.
 - 2. Prohibited Locations:
 - a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - b. Do not install natural-gas piping in solid walls or partitions.
- P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- Q. Connect branch piping from top or side of horizontal piping.
- R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- S. Do not use natural-gas piping as grounding electrode.

- T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."
- V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

3.5 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.6 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 - 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
 - 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
 - 2. Bevel plain ends of steel pipe.
 - 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

- F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.
- G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hangers and supports specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
 - 5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.8 CONNECTIONS

- A. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- B. Install piping adjacent to appliances to allow service and maintenance of appliances.
- C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

- A. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 PAINTING

- A. Comply with requirements in Division 09 painting Sections for painting interior and exterior natural-gas piping.

- B. Paint exposed, interior and exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
 - 1. Alkyd System: MPI EXT 5.1D.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Exterior alkyd enamel (flat).
 - d. Color: yellow.
- C. Paint exposed, interior metal piping, valves, service regulators, and piping specialties, except components, with factory-applied paint or protective coating.
- D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Use 3000-psig, 28-day, compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.12 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Test, inspect, and purge natural gas according to NFPA 54 and the New York Fuel Gas Code and authorities having jurisdiction.
- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Aboveground natural-gas piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Steel pipe with wrought-steel fittings and welded joints.
- F. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.13 PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. PIPE SIZE AND PRESSURE LIMITATION FOR GAS PIPING

PSIG	Gas Pipe Installation
In Excess of ½ psig - 5 psig	Gas distribution pipe operating size 4-inch or larger must be welded.
In Excess of 5 psig	All gas distribution pipes operating above 5 psig must be welded.
All welding of gas distribution pipe shall be subject to DOB special inspection (NYCFG Section.403)	
All piping 4-Inch or larger operating in excess of 5 psig must be butt-welded, Subject to DOB special inspection and radio-graphed	
Threaded piping may be used up to 4-inch at pressure no greater than ½ psig.	

B. Aboveground, branch piping smaller than 4" NPS and less than ½ psi shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

C. All welded distribution piping shall be one of the following:

1. Steel pipe with wrought-steel fittings and welded joints.

D. Underground, piping shall be one of the following:

1. Steel pipe with wrought-steel fittings and welded joints. (NOT USED)
2. HDPE pipe and Fittings with fusion welded joints

E. All piping buried under buildings shall be in containment piping;

1. Containment Conduit for gas pipe: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
2. Containment Conduit for gas vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.14 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at regulator shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 and larger at service regulator shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

E. Valves in branch piping for single appliance shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

END OF SECTION 221114

SECTION 22 11 16
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
- 2. Specialty valves.
- 3. Flexible connectors.
- 4. Water meters furnished by utility company for installation by Contractor.

B. Related Section:

- 1. Division 22 Section "Facility Water Distribution Piping" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.3 SUBMITTALS

A. Product Data: For the following products:

- 1. Specialty valves.
- 2. Transition fittings.
- 3. Dielectric fittings.
- 4. Flexible connectors.

B. LEED Submittal:

- 1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content.

C. Water Samples: Specified in "Cleaning" Article.

D. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

- 1. Fire-suppression-water piping.

2. Domestic water piping.
3. HVAC hydronic piping.

E. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 61 for potable domestic water piping and components.

1.5 PROJECT CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 1. Notify Construction Manager, Owner no fewer than two days in advance of proposed interruption of water service.
 2. Do not proceed with interruption of water service without Construction Manager's, Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
 1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
 2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
 3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
 4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 SPECIALTY VALVES

- A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.
- B. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.5 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.
- B. Dielectric Unions:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - d. Zurn Plumbing Products Group; Wilkins Water Control Products.
 - 2. Description:
 - a. Pressure Rating: 150 psig at 180 deg F.
 - b. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. EPCO Sales, Inc.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Factory-fabricated, bolted, companion-flange assembly.
 - b. Pressure Rating: 150 psig.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
2. Description:
 - a. Nonconducting materials for field assembly of companion flanges.
 - b. Pressure Rating: 150 psig.
 - c. Gasket: Neoprene or phenolic.
 - d. Bolt Sleeves: Phenolic or polyethylene.
 - e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Calpico, Inc.
 - b. Lochinvar Corporation.
2. Description:
 - a. Galvanized-steel coupling.
 - b. Pressure Rating: 300 psig at 225 deg F.
 - c. End Connections: Female threaded.
 - d. Lining: Inert and noncorrosive, thermoplastic.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.
- C. Install shutoff valve immediately upstream of each dielectric fitting.
- D. Install domestic water piping level without pitch and plumb.
- E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- H. Install piping adjacent to equipment and specialties to allow service and maintenance.
- I. Install piping to permit valve servicing.
- J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.
- K. Install piping free of sags and bends.
- L. Install fittings for changes in direction and branch connections.
- M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.
- E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- G. Copper-Tubing, Push-on Joints: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.
- H. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- I. Copper-Tubing Grooved Joints: Roll groove end of tube. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for roll-grooved joints.
- J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

- A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.
- B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

- C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."
 - 1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
 - 2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

3.4 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples or unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.
- B. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet If Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
- F. Install supports for vertical copper tubing every 10 feet

- G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.
- B. Label pressure piping with system operating pressure.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Piping Inspections:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - 2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - 3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- C. Piping Tests:
 - 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

- c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Aboveground domestic water piping shall be one of the following:
 - 1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and brazed or soldered joints.

3.12 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
 - 2. Drain Duty: Hose-end drain valves.

END OF SECTION 221116

SECTION 22 11 19
DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Balancing valves.
3. Temperature-actuated water mixing valves.
4. Strainers.
5. Outlet boxes
6. Hose bibbs.
7. Wall hydrants.
8. Drain valves.
9. Water hammer arresters.
10. Air vents.
11. Backflow preventers.
12. Trap-seal primer valves.

- B. Related Sections include the following:

1. Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Division 22 Section "Domestic Water Piping".

1.3 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. NSF Compliance:
 - 1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
 - 2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Watts model 288A or a comparable product by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Zurn Plumbing Products Group; Wilkins Div.
 - 2. Standard: ASSE 1001.
 - 3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
 - 4. Body: Bronze.
 - 5. Inlet and Outlet Connections: Threaded.
 - 6. Finish: Chrome plated.

2.2 BALANCING VALVES

- A. Memory-Stop Balancing Valves:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Conbraco Industries, Inc.
 - b. Crane Co.; Crane Valve Group
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - 2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
 - 3. Pressure Rating: 400-psig minimum CWP.
 - 4. Size: NPS 2 or smaller.

5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.3 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Individual-Fixture, Water Tempering Valves:

1. Lawler Company Model 911, or a comparable product by one of the following:
 - a. Armstrong International, Inc.
 - b. Leonard Valve Company.
 - c. Powers; a Watts Industries Co.
 - d. Symmons Industries, Inc.
2. Standard: ASSE 1016, thermostatically controlled water tempering valve.
3. Pressure Rating: 125 psig minimum, unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 80°F

B. Primary Thermostatic, Water Mixing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Holby Valve Co., Inc.
 - b. Lawler Manufacturing Company, Inc.
 - c. Leonard Valve Company.
 - d. Powers; a Watts Industries Co.
 - e. Symmons Industries, Inc.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig.
4. Type: Exposed-mounting, thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Pressure Rating: 125 psig minimum, unless otherwise indicated.
9. Tempered-Water Setting: 120°F
10. Valve Finish: Rough bronze.
11. Piping Finish: Copper

2.4 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.033 inch.
 - b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.5 OUTLET BOXES

A. Clothes Washer Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acorn Engineering Company.
 - b. Oatey.
 - c. Watts; a Watts Water Technologies company.
 - d. Zurn Industries, LLC.
2. Mounting: Recessed.
3. Material and Finish: Enameled-steel or epoxy-painted-steel or Stainless-steel box and faceplate.
4. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
5. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
6. Drain: NPS 2 standpipe and P-trap for direct waste connection to drainage piping.
7. Inlet Hoses: Two 60-inch- long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
8. Drain Hose: One 48-inch- long, rubber household clothes washer drain hose with hooked end.

2.6 HOSE BIBBS

A. Interior Mechanical Room Application:

- a. Watts Model HB-1 in exposed piping.
 - b. Nibco Model 72 or 73 in exposed piping.
 - c. Nibco Model 63 or 763 in concealed piping.
1. Standard: ASME A112.18.1 for sediment faucets.

2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Operation for Equipment Rooms: Wheel handle or operating key.
10. Include operating key with each operating-key hose bibb.

B. Interior Toilet Room Application:

- a. Woodford Manufacturing Model 24P.
 - b. Chicago Faucet Model 952.
1. Body: Bronze or brass with integral mounting flange.
 2. Seat: Bronze, replaceable.
 3. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
 4. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
 5. Pressure Rating: 125 psig.
 6. Vacuum Breaker: Integral, drainable, hose-connection vacuum breaker complying with ASSE 1011.
 7. Finish: chrome or nickel plated.
 8. Operation: Wheel handle or operating key.
 9. Include operating key with each operating-key hose bibb.

2.7 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Jay R. Smith Model 5509-QT or a comparable product by one of the following
 - a. Josam Company Model 71000.
 - b. Watts Drainage Products Inc.
 - c. Zurn Plumbing Products Group .Model Z-1300
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounting with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.

2.8 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4.
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.9 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Jay R. Smith Model 5000 or a comparable product by one of the following:
 - a. AMTROL, Inc.
 - b. Josam Company.
 - c. PPP Inc.
 - d. Watts Drainage Products Inc.
 - e. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Stainless steel construction with metal bellows, precharged.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.10 BACKFLOW PREVENTERS

A. Double-Detector Check Backflow-Prevention Assemblies:

1. WATTS INDUSTRIES – model as indicated on Drawings.
 - a. FEBCO; SPX Valves & Controls.
 - b. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1015.

3. Operation: Continuous-pressure applications, unless otherwise indicated.
4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
5. Size, Design Flow Rate: as indicated on drawings.
6. Body: stainless steel.
7. End Connections: Flanged.
8. Configuration: Designed for horizontal, straight through flow.
9. Accessories:
 - a. Valves: Outside screw and yoke gate-type with flanged ends on inlet and outlet.

B. Reduced-Pressure-Principle Backflow Preventers:

1. WATTS INDUSTRIES model 009, sized as indicated on Drawings:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
5. Body: Bronze for NPS 2 and smaller.
6. End Connections: Threaded for NPS 2 and smaller.
7. Configuration: Designed for horizontal, straight through flow.
8. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Backflow-Preventer Test Kits:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. FEBCO; SPX Valves & Controls.
 - b. Watts Industries, Inc.; Water Products Div.
 - c. Zurn Plumbing Products Group; Wilkins Div.
2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.11 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. PPP Inc Model P-2 with Distribution Unit DU-2 or a comparable product by one of the following:
 - a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - b. Watts Industries, Inc.; Water Products Div.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.

4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install balancing valves in locations where they can easily be adjusted.
- C. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 1. Install thermometers and water regulators if specified.
- D. Install Y-pattern strainers for water on supply side of each control valve, solenoid valve, and pump, and where indicated on Drawings.
- E. Install water hammer arresters in water piping according to PDI-WH 201.
- F. Install air vents at high points of water piping.
- G. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- H. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- I. Thermostatic mixing valves shall have a line sized solenoid valve installed in the primary hot water (inlet side), side to the mixing valve. There shall be strap on "aquastat" type temper sensor located on the mixed discharge side or outlet set at 5 degrees higher than the discharge temperature set point. The sensor shall be arranged to close the solenoid valve on the inlet side if the discharge temperature goes above set point.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Water pressure-reducing valves.
 - 2. Primary, thermostatic, water mixing valves.
 - 3. Primary water tempering valves.
 - 4. Backflow Preventers.
 - 5. Supply-type, trap-seal primer valves.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
 - 1. Test each backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 221119

SECTION 22 13 16
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittal:
 - 1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager, Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Construction Manager's, Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class.
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ANACO-Husky.
 - b. Dallas Specialty & Mfg. Co.
 - c. MIFAB, Inc.
 - d. Tyler Pipe.
 2. Standards: ASTM C 1277 and CISPI 310.
 3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. Cast-Iron, Hubless-Piping Couplings:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. MG Piping Products Company.
 2. Standard: ASTM C 1277.

3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- C. Hard Copper Tube: ASTM B 88, Type L and Type M, water tube, drawn temper.
- D. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.
- E. Copper Pressure Fittings:
 1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- F. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- G. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.5 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 3. Unshielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1173.
 - b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

- a. Standard: ASTM C 1460.
- b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

2. Dielectric Unions:

- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1) Capitol Manufacturing Company.
- 2) Hart Industries International, Inc.
- 3) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 4) Wilkins; a Zurn company.

- b. Description:

- 1) Standard: ASSE 1079.
- 2) Pressure Rating: 125 psig minimum at 180 deg F.
- 3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Nipples:

- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1) Grinnell Mechanical Products.
- 2) Precision Plumbing Products, Inc.
- 3) Victaulic Company.

- b. Description:

- 1) Electroplated steel nipple complying with ASTM F 1545.
- 2) Pressure Rating: 300 psig at 225 deg F.
- 3) End Connections: Male threaded or grooved.
- 4) Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- L. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- M. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- N. Install engineered soil and waste drainage and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.

- O. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Division 22 Section "Sanitary Waste Piping Specialties."
 - 2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Sanitary Waste Piping Specialties."
- P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.
- C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- F. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

3.3 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
4. Vertical Piping: MSS Type 8 or Type 42, clamps.
5. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
7. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

C. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

D. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.

E. Install supports for vertical cast-iron soil piping every 15 feet.

F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.

3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.

G. Install supports for vertical steel piping every 15 feet.

H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.

I. Install supports for vertical copper tubing every 10 feet.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
2. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
3. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

D. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.6 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.

3.8 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PIPING SCHEDULE

- A. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- B. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 - a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2: Hard copper tube, Type M; copper pressure fittings; and soldered joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
1. Service class, cast-iron soil piping; gaskets; and gasketed or calking materials; and calked joints.
 2. Hubless, cast-iron soil pipe and fittings; cast-iron hubless-piping couplings; and coupled joints.
 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 22 13 16

SECTION 22 13 19
SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following sanitary drainage piping specialties:
 - 1. Cleanouts.
 - 2. Floor Drains.
 - 3. Roof flashing assemblies.
 - 4. Through-penetration firestop assemblies.
 - 5. Miscellaneous sanitary drainage piping specialties.
 - 6. Solids interceptors.
- B. Related Sections include the following:
 - 1. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. HDPE: High-density polyethylene plastic.
- C. PE: Polyethylene plastic.
- D. PP: Polypropylene plastic.
- E. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Field quality-control test reports.

- D. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

- 1. Available Manufacturers:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
- 2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
- 3. Size: Same as connected drainage piping
- 4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
- 5. Closure: Countersunk or raised-head, brass plug.
- 6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
- 7. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts:

- 1. Jay R. Smith Model 4028:
 - a. Josam Company; Josam Div.
 - b. Watts Drainage Products Inc.
 - c. Zurn Plumbing Products Group; Light Commercial Operation.
- 2. Standard: ASME A112.36.2M.
- 3. Size: Same as connected branch.
- 4. Type: Threaded, adjustable housing.
- 5. Body or Ferrule: Cast iron.
- 6. Clamping Device: Required.
- 7. Closure: Brass plug with tapered threads.
- 8. Adjustable Housing Material: Cast iron.

9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Medium Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
13. Standard: ASME A112.3.1.
14. Size: Same as connected branch.
15. Housing: Stainless steel.
16. Closure: Stainless steel with seal.
17. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Jay R. Smith Model 4472:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Watts Drainage Products Inc.
 - d. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch, or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.2 BACKWATER VALVES

A. Horizontal, Cast-Iron Backwater Valves

1. Josam
2. JR Smith

B. Standard: ASME A112.14.1.

1. Size: Same as connected piping.
2. Body: Cast iron.
3. Cover: Cast iron with bolted or threaded access check valve.
4. End Connections: Hub and spigot, Hub and spigot, or hubless Hubless.
5. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang open for airflow unless subject to backflow condition.
6. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

C. Drain-Outlet Backwater Valves:

1. Josam
2. JR Smith
3. Size: Same as floor drain outlet.
4. Body: Cast iron or bronze made for vertical installation in bottom outlet of floor drain.

5. Check Valve: Removable ball float.
6. Inlet: Threaded.
7. Outlet: Threaded or spigot.

2.3 FLOOR DRAINS

A. Finished Areas/Toilet Rooms:

1. Jay R. Smith model 2005Y-A or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Tyler Pipe; Wade Div.
 - c. Watts Drainage Products Inc.
 - d. Zurn Plumbing Products Group; Light Commercial Operation.
2. Assembly: ANSI A112.21.2. Body: Duco cast iron with flashing. Accessories: Flashing collar with adjustable strainer head with sediment bucket.
3. Anchor Flange and clamping device: Required.
4. Top or Strainer Material: Round Nickel bronze.
5. Top Loading Classification: Light Duty.
6. Provide vandal proof top.
7. All floor drains shall be provided with a deep seal "P" trap.

B. MER spaces & Kitchen areas where not otherwise indicated on the food service drawings:

1. Jay R. Smith model 2420 or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Tyler Pipe; Wade Div.
 - c. Watts Drainage Products Inc.
 - d. Zurn Plumbing Products Group; Light Commercial Operation.
2. ANSI A112.21.1; Duco cast iron body with hinged grate, locking device, sediment bucket and flashing collar.
3. Anchor Flange and clamping device: Required.
4. Trap Material: Cast iron.
5. All floor drains shall be provided with a deep seal "P" trap.

C. Funnel Floor Drains:

1. Jay R. Smith model 3720 or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Tyler Pipe; Wade Div.
 - c. Watts Drainage Products Inc.
 - d. Zurn Plumbing Products Group; Light Commercial Operation.
2. Assembly: ANSI A112.21.2. Body: Duco cast iron with flashing. Accessories: Flashing collar with adjustable strainer head with sediment bucket, and funnel.
3. Anchor Flange and clamping device: Required.
4. Top or Strainer Material: Round Nickel bronze.
5. Top Loading Classification: Light Duty.
6. Trap Material: Cast iron.
7. All floor drains shall be provided with a deep seal "P" trap.

2.4 AIR-ADMITTANCE VALVES

A. Fixture Air-Admittance Valves:

1. Standard: ASSE 1051, Type A for single fixture or Type B for branch piping.
2. Housing: Plastic.
3. Operation: Mechanical sealing diaphragm.
4. Size: Same as connected fixture or branch vent piping.

B. Stack Air-Admittance Valves:

1. Standard: ASSE 1050 for vent stacks.
2. Housing: Plastic.
3. Operation: Mechanical sealing diaphragm.
4. Size: Same as connected stack vent or vent stack.

C. Wall Box for Air-Admittance Valves:

1. Description: White plastic housing with white plastic grille, made for recessed installation. Include bottom pipe connection and space to contain one air-admittance valve.

2.5 AREA DRAINS

A.

1. Jay R. Smith model 2225 or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Tyler Pipe; Wade Div.
 - c. Watts Drainage Products Inc.
 - d. Zurn Plumbing Products Group; Light Commercial Operation.
2. Assembly: ANSI A112.21.2.
3. "Safe-Set" bucket with flange, suitable for concrete deck installation. Cast iron body and flashing collar, with flush-mounted cast iron grate and sediment bucket. Side outlet, round top.
4. Provide vandal proof top.

2.6 ROOF FLASHING ASSEMBLIES (all architectural specifications shall supersede this paragraph).

A. Roof Flashing Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Acorn Engineering Company; Elmdor/Stoneman Div.
 - b. Thaler Metal Industries Ltd.

- B. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
 - 1. Open-Top Vent Cap: Without cap.
 - 2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
 - 3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.7 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

- A. Through-Penetration Firestop Assemblies:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ProSet Systems Inc.
 - 2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
 - 3. Size: Same as connected soil, waste, or vent stack.
 - 4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
 - 5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
 - 6. Special Coating: Corrosion resistant on interior of fittings.

2.8 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

- A. Expansion Joints:
 - 1. Standard: ASME A112.21.2M.
 - 2. Body: Cast iron with bronze sleeve, packing, and gland.
 - 3. End Connections: Matching connected piping.
 - 4. Size: Same as connected soil, waste, or vent piping.
- B. Floor-Drain, Trap-Seal Primer Fittings:
 - 1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
 - 2. Size: Same as floor drain outlet with NPS 1/2 side inlet.
- C. Stack Flashing Fittings:
 - 1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
 - 2. Size: Same as connected stack vent or vent stack.
- D. Vent Caps:
 - 1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.

2. Size: Same as connected stack vent or vent stack.

E. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.9 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft. thickness.
2. Vent Pipe Flashing: 8 oz./sq. ft. thickness.

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.10 SOLIDS INTERCEPTORS

A. Solids Interceptors:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith Model 8710
Or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Type: Factory-fabricated interceptor made for removing and retaining sediment from wastewater.
3. Body Material: Cast iron or steel.
4. Interior Separation Device: Screens.
5. Interior Lining: Corrosion-resistant enamel.
6. Mounting: Above floor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 1. Position floor drains for easy access and maintenance.
 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

- F. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.
- G. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- H. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
- I. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- J. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- K. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 - 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 - 2. Size: Same as floor drain inlet.
- L. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- M. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- N. Install vent caps on each vent pipe passing through roof.
- O. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet. Install trap on interceptors that do not have integral trap and are connected to sanitary drainage and vent systems.
- P. Install wood-blocking reinforcement for wall-mounting-type specialties.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.3 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.

2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

SECTION 224213.13 - COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Floor-mounted, bottom-outlet water closets.
 - 2. Wall-mounted water closets.- Back outlet.
 - 3. Flushometer valves.
 - 4. Toilet seats.
 - 5. Supports.

- B. Related Requirements:

- 1. Section 221316 "Sanitary waste and vent piping
 - 2. Section 221319 "sanitary waste piping specialties.

1.3 DEFINITIONS

- A. Effective Flush Volume: Average of two reduced flushes and one full flush per fixture.
- B. Remote Water Closet: Located more than 30 feet from other drain line connections or fixture and where less than 1.5 drainage fixture units are upstream of the drain line connection.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

- B. Sustainable Design Submittals:

- 1. Product Data: For water consumption.

- C. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than six of each type.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED, BOTTOM-OUTLET TANK-TYPE WATER CLOSETS

- A. Water Closets, Floor Mounted, Bottom Outlet, **P-2:**
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard.
 - b. Crane Plumbing, L.L.C.
 - c. Kohler Co.
 - d. Sloan Valve Company.
 - e. Zurn Industries, LLC.
 - 2. Bowl:
 - a. Standards: ASME A112.19.2/CSA B45.1.
 - b. Material: Vitreous china.
 - c. Type: Siphon jet or reverse trap.
 - d. Style: Tank
 - e. Height: 16.5".
 - f. Rim Contour: Modified elongated.
 - g. Water Consumption: 1.6 gal. per flush.
 - h. Color: White.
 - 3. Bowl-to-Drain Connecting Fitting: ASME A112.4.3.
 - 4. Flushometer Valve: model 6065 ADA compliant, hands free. .
 - 5. Toilet Seat: IAPMO/ANSI Z124.5, Type A (residential), Shape 3 (elongated rim), open front, without cover, and shaped to match bowl.

2.2 TOILET SEATS

- A. Toilet Seats **P-2:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard.
 - b. Church Seats; Bemis Manufacturing Company.
 - c. Kohler Co.
 - d. Zurn Industries, LLC.
2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Standard).
5. Shape: Elongated rim, open front.
6. Hinge: Self-sustaining, check.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.
- B. Examine walls and floors for suitable conditions where water closets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Water-Closet Installation:
 1. Install level and plumb according to roughing-in drawings.
 2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
 3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.
- B. Support Installation:
 1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
 2. Use carrier supports with waste-fitting assembly and seal.
 3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
 4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.
- C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
4. Install actuators in locations that are easy for people with disabilities to reach.
5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

- B. Install protective covering for installed water closets and fittings.
- C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

SECTION 22 42 16 - COMMERCIAL LAVATORIES AND FAUCETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

1. Engineered stone commercial lavatory units.
 - a. Lavatory faucets.
 - b. Soap dispensers.
2. Vitreous China – wall hung
3. Shields and Guards

1.2 RELATED SECTIONS

1. 221116 "Domestic Water Piping Specialties"
2. 221119 "Domestic Water Piping Specialties"

1.3 REFERENCES

- A. American Society of Sanitary Engineering (ASSE):
 1. ASSE 1070 - Water Temperature Limiting Devices.
- B. American Society of Mechanical Engineers (ASME):
 1. ASME A112.18.1 - Plumbing Fixture Fittings.
- C. ASTM International (ASTM):
 1. ASTM C 170 - Standard Test Method for Compressive Strength of Dimension Stone.
 2. ASTM D 570 - Standard Test Method for Water Absorption of Plastics.
 3. ASTM D 785 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.
 4. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 5. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. International Code Council (ICC):
 1. ICC/ANSI A117.1 – Accessible and Usable Buildings and Facilities.
- E. National Fire Protection Association (NFPA):

1. NFPA 70 – National Electrical Code.

F. Underwriters Laboratories, Inc. (UL):

1. UL 723 - Test For Surface Burning Characteristics of Building Materials.
2. UL 1951 - Electric Plumbing Accessories.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:

1. Product Data: For water consumption.

C. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.5 INFORMATION SUBMITTALS

A. Sample warranty.

B. Manufacturer's certificates.

C. Indoor environmental quality certificates.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Servicing and adjustments of automatic faucets.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

1.8 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** Approved manufacturer listed in this section, with minimum 5 years experience in the manufacture of plumbing fixtures. Manufacturers seeking approval must submit the following:
 - 1. Product data, including test data from qualified independent testing agency indicating compliance with requirements.
 - 2. Samples of each component of product specified.
 - 3. List of successful installations of similar products available for evaluation by Architect.
 - 4. Submit substitution request not less than 15 days prior to bid date.
- B. **Source Limitations:** Obtain each type of plumbing fixture and compatible accessories through one source from a single approved manufacturer.
- C. **Accessibility Requirements:** Comply with requirements of ADA/ABA and with requirements of authorities having jurisdiction.
- D. **Water Flow and Consumption Requirements:** Comply with EPACT.
- E. **Drinking Water Standard:** Certified to NSF/ANSI 372.
- F. **Electrical Components:** Listed and labeled per NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- G. **Indoor Environmental Quality Certification:** Provide certificate indicated that products have been certified under the following programs, or a comparable certification acceptable to Owner:
 - 1. GREENGUARD Indoor Air Quality Certified.
 - 2. GREENGUARD Certified for Children and Schools.

1.9 WARRANTY

- A. **Special Manufacturer's Warranty:** Provide manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship within the following periods:
 - 1. Engineered natural quartz material: 10 years.
 - 2. Faucets: 1 year.
 - 3. WashBar: 1 year

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products of Bradley Corporation

1. Submit requests for substitution in accordance with Instructions to Bidders and Division 01 General Requirements.

B. MATERIALS

2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES (P-1)

- A. Lavatory P-2A: vitreous china, wall mounted.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard.
 - b. Kohler Co.
 - c. Peerless Pottery Sales, Inc.
 - d. Sloan Valve Company.
2. Fixture:
 - a. Standard: ASME A112.19.2/CSA B45.1.
 - b. Type: For wall hanging.
 - c. Nominal Size: Rectangular, **20 by 18 inches**
 - d. Faucet-Hole Punching: Three hole.
 - e. Faucet-Hole Location: Top.
 - f. Color: White.
3. Faucet: American Standard Princeton Two-Handle Centerset Lavatory Faucet, Solid-Brass, ceramic disc valve cartridges, lead free.
4. Support: Type II, concealed-arm lavatory carrier with escutcheons..
5. Lavatory Mounting Height: Standard.
6. Basis of Design Manufacturer/Model: **American Standard, Model 0124.131.**

2.3 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Engineered Brass Co.
 - b. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
 - c. McGuire Manufacturing Co., Inc.
 - d. Plumberex Specialty Products Inc.

- e. TCI Products.
 - f. TRUEBRO, Inc.
 - g. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.
 - 2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
- B. Protective Shielding Piping Enclosures:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. TRUEBRO, Inc.
 - 2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Assemble fixtures, accessories, and associated fittings and trim in accordance with manufacturer's instructions.
- B. Install fixture supports firmly attached to building structure.
- C. Install fixtures level, plumb, and in accordance with manufacturer's rough-in instructions.
- D. Install water supply piping. Provide stop on each supply in readily-serviceable location. Fasten supply piping to supports or substrate.
- E. Install trap and waste piping to each fixture.
- F. Install escutcheons at exposed piping penetrations in finished locations and within cabinets.
- G. Seal joints between fixtures and walls, floors, and countertops with mildew-resistant silicone sealant meeting requirements in Division 07 Section "Joint Sealants."
- H. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."
- I. Exposed metal trim and roughing shall be chrome plated nickel brass. Chrome plated cast brass 'p' traps with screw plug cleanout, slip-joint inlet and female cast swivel threaded elbow outlet. Chrome plated brass nipple to wall with chrome plated escutcheon. Swing spouts shall have 140° swing limit stops.
- J. Wall hung lavatories, except as specifically noted otherwise, shall be supported on concealed chair carriers, single or double as required, with steel uprights, adjustable concealed arms and sleeves, alignment truss, and block bases. Carrier arms shall be provided with leveling device.

- K. Provide chrome plated traps, nipples, stop valves, and supplies for fixtures supplied by other sections.
- L. Provide protection shield guards on all exposed piping under sinks and lavatories.

3.2 CLEANING AND PROTECTION

- A. Repair or replace defective work, including damaged fixtures and components.
- B. At time of Substantial Completion:
 - 1. Clean unit surfaces, test fixtures, and leave in ready-to-use condition.
 - 2. Install new batteries in battery-operated devices.
 - 3. Fill soap dispensers.
 - 4. Turn over keys, tools, maintenance instructions, and maintenance stock to Owner.
- C. Protect units with water-resistant temporary covering. Do not allow temporary use of plumbing fixtures. Remove protection at Substantial Completion and dispose.

3.3 TESTING AND ADJUSTING

- A. Set field-adjustable temperature set points of temperature-actuated water mixing valves. Adjust set point within allowable temperature range.
- B. Test and adjust installation.
- C. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- D. Operate and adjust controls. Replace damaged and malfunctioning units and controls.
- E. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.
- F. Replace washers and seals of leaking and dripping faucets and stops.

END OF SECTION

SECTION 224216.16 - COMMERCIAL SINKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Service basins.
2. Utility sinks.
3. Handwash sinks.
4. Laminar-flow, faucet-spout outlets.
5. Supports.

- B. Related Requirements:

1. Section 224100 "Residential Plumbing Fixtures" for residential sinks.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

- B. Sustainable Design Submittals:

1. Product Data: For water consumption.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sinks to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

A. Kitchen/Utility Sinks - Stainless Steel, Counter Mounted: **P-4** .

1. Basis of Design: American Standard model 15DB.332284.073
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard
 - b. AERO Manufacturing Company.
 - c. Elkay Manufacturing Co.
 - d. Sloan Valve Company.
3. Source Limitations: Obtain sinks from single source from single manufacturer.
4. Fixture:
 - a. Standard: ASME A112.19.3/CSA B45.4.
 - b. Type: Stainless steel, self-rimming, sound-deadened unit less ledge back.
 - c. Number of Compartments: Two.
 - d. Overall Dimensions: 33-3/8"x22"x9" .
 - e. Material: 18 gauge, Type 304 stainless steel.
 - f. Each Compartment:
 - 1) Dimensions: 15"x17" .
 - 2) Drains: Grid with NPS 1-1/2 (DN 40) tailpiece and twist drain.
 - 3) Drain Location: Near back of compartment.
 - 4) Depth: Standard.
5. Faucet: American Standard Monterey Series model 6404.141, two handle, bottom mount, swivel spout, lead free.
 - a. Number Required: One.
 - b. Mounting: On ledge.
6. Supply Fittings:
 - a. Standard: ASME A112.18.1/CSA B125.1.
 - b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

- 1) Operation: Wheel handle.
 - 2) Risers: NPS 1/2, ASME A112.18.6, braided or corrugated stainless-steel flexible hose.
 - 3) Mechanical mixing valve
7. Waste Fittings:
- a. Standard: ASME A112.18.2/CSA B125.2.
 - b. Trap:
 - 1) Size: NPS 1.5".
 - 2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.
 - c.

2.2 HANDWASH SINKS

A. Handwash Sinks **P-3**: Stainless steel, wall mounted.

1. Basis of Design: Krown Metal Model HS-9-LF
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krowne Metal Corporation
 - b. AERO Manufacturing Company.
 - c. Elkay Manufacturing Co.
 - d. Sloan Valve Company.
3. Fixture:
 - a. Standards: ASME A112.19.3/CSA B45.4 and NSF/ANSI 2.
 - b. Type: Basin with square corners, high back for faucet, and support brackets.
 - c. Nominal Size: 12" x 17" x 12"
 - d. Backsplash: 8"
 - e. Drain: 1 1/2"
 - f. Material; 14 gauge stainless steel.
4. Faucet: Krowne Commercial series model 10-406L, splash mount, 6" swing spout, chrome finish, lead free, 2 gpm max
5. Supply Fittings:
 - a. Standard: ASME A112.18.1/CSA B125.1.
 - b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.
 - 1) Operation: Wheel handle.

- 2) Risers: NPS 1/2, ASME A112.18.6, braided or corrugated stainless-steel flexible hose.
 - 3) Mechanical mixing valve
6. Waste Fittings:
 - a. Standard: ASME A112.18.2/CSA B125.2.
 - b. Trap:
 - 1) Size: NPS 1.5".
 - 2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.
7. Support: Type II sink carrier.
8. Mounting Height: as per plan.

2.3 LAMINAR-FLOW, FAUCET-SPOUT OUTLETS

- A. NSF Standard: Comply with NSF 372 for faucet-spout-outlet materials that will be in contact with potable water.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AM Conservation Group, Inc.
 2. Chronomite Laboratories, Inc; a division of Morris Group International.
 3. NEOPERL, Inc.
 4. T&S Brass and Bronze Works, Inc.
- C. Description: Chrome-plated brass, faucet-spout outlet that produces non-aerating, laminar stream. Include external or internal thread that mates with faucet outlet for attachment to faucets where indicated and flow-rate range that includes flow of faucet.

2.4 SUPPORTS

- A. Type II Sink Carrier:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg Co; a division of Morris Group International.
 - b. Josam Company.
 - c. Wade Drains.
 - d. WATTS.
 - e. Zurn Industries, LLC.
 2. Standard: ASME A112.6.1M.

2.5 GROUT

- A. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.6 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Engineered Brass Co.
 - b. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
 - c. McGuire Manufacturing Co., Inc.
 - d. Plumberex Specialty Products Inc.
 - e. TCI Products.
 - f. TRUEBRO, Inc.
 - g. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.
- 2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. TRUEBRO, Inc.

- 2.7 Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.
- B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install sinks level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-hung sinks.
- C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.
- D. Set floor-mounted sinks in leveling bed of cement grout.
- E. Install water-supply piping with stop on each supply to each sink faucet.
 - 1. Exception: Use ball valves if supply stops are not specified with sink.
 - 2. Install stops in locations where they can be easily reached for operation.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."
- I. Provide protective shield guard for art room sinks and all Lavatories
- J. Install clay / solids interceptors at all art room utility sinks.

3.3 CONNECTIONS

- A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of sinks, inspect and repair damaged finishes.
- B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed sinks and fittings.
- D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. These basic Mechanical Requirements apply to all Division 23 Sections.
- B. The work of this Section consists of providing of all materials, labor and equipment and the like necessary and/or required for the complete execution of all HVAC and related work for this project, as required by the contract documents.

1.02 RELATED SECTIONS

- A. Refer to Division 1 Specification.

1.03 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER RESPECTIVE SECTIONS OF THIS DIVISION

- A. Motor starters shall be furnished under this Division. Refer to Specification Section 230513 Common motor requirements for HVAC equipment" for technical information.

1.04 REFERENCES

- A. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers Guides and Standards, latest editions.
- B. SMACNA - Sheet Metal and Air Conditioning Contractors National Association.
- C. ASME - American Society of Mechanical Engineers.
- D. UL - Underwriters Laboratory.
- E. NFPA - National Fire Protection Association.

1.05 REGULATORY REQUIREMENTS

- A. Conform to New York City Building Code and Energy Code as well as all local codes.
- B. Plumbing: Conform to New York State U.F.P.B.C.
- C. Obtain permits, and request inspections from authority having jurisdiction.

1.06 QUALITY ASSURANCE

The Contractor shall have the work indicated on the drawings and/or specified in each section performed by vendors or mechanics experienced and skilled in its implantation or by a "Specialist", "Specialty Contractor" or "Specialty Subcontractor" under contractual agreement with the Contractor. These terms mean an individual or firm of established reputation, or, if newly organized, whose personnel have previously established a reputation in the same field,

which is regularly engaged in, and which maintains a regular force of workmen skilled in either manufacturing or fabricating items required by the Contract, installing items required by the Contract, or otherwise performing work required by the Contract.

Where the Contract Specifications require installation by a "Specialist," that term shall also be deemed to mean either the manufacturer of the item, an individual or firm licensed by the manufacturer, or an individual or firm who will perform such work under the manufacturer's direct supervision.

1.07 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed arrangement of Work to meet Project conditions, including changes to Work specified in other Sections.

1.08 SCOPE OF WORK

- A. This Contractor shall be responsible for coordinating his work with all other trades.
- B. The Contractor shall provide all materials, labor, equipment, tools, appliances, services, hoisting, scaffolding, supervision and overhead for the furnishing and installing of all mechanical work and related work including but not limited to the following:

- Demolition of existing work including, piping, specilaties, radiators and miscellaneous equipment.
- New chilled water piping system, valves fitting and specilaties
- New hot water piping system, valves fitting and specilaties
- New split system chiller
- Fan coil units
- Ductwork systems and specilaties
- New pumps and specilaties
- Pipe, duct and equipment insulation
- Motor starters, VFDs and disconnects.
- New automatic temperture controls
- Protection.
- Identification.
- Coordination.
- Phasing.
- Rigging.
- Testing and Balancing Reports Air
- Shop Drawings.
- As-Built Drawings and Maintenance Manuals.
- Warrantees.

PART 2 PRODUCTS

2.01 GENERAL

- A. Construct all apparatus of materials and pressure ratings suitable for the conditions encountered during continuous operation.
- B. Where corrosion can occur, appropriate corrosion resistant materials and assembly methods must be used including isolation of dissimilar metals against galvanic interaction. Resistance to corrosion must be achieved by the use of the appropriate base materials. Coatings shall be restored to only when specifically permitted by the Specification.
- C. Construct all equipment in accordance with requirements of all applicable codes. All pressure vessels and safety devices that fall within the scope of the ASME Code shall conform to the Code and bear the ASME label or stamp.
- D. Match and balance all system components to achieve compatibility of equipment or satisfactory operation and performance throughout the entire operating temperature and control ranges. All installations shall be in accordance with manufacturer's recommendations.
- E. Provide all controls, wiring, piping, valves, accessories and other components necessary to make all systems complete and operable.
- F. the contractor shall warranty all work, including labor and materials, and equipment furnished and installed as part of this contract for a minimum period of year from the date of acceptance by the owner, in writing. Certain equipment, such as underground fuel tanks, may have longer warranties as indicated in the specifications. In such cases the longer of the two warranties shall prevail.

2.02 SHOP DRAWINGS AND SUBMITTALS (COORDINATE WITH DIVISION 1)

- A. Shop drawings and samples shall be prepared and submitted in accordance with the requirements established in the contract and shall consist of the all items listed in the following paragraphs.
- B. Manufacturer's data or shop drawings giving full information as to dimensions, materials, and all information pertinent to the adequacy of the submitted equipment shall be submitted for review. Shop drawings shall include, but not be limited to the following:
- C. Submit all Mechanical equipment noted and scheduled on plans including but not limited to the following:
 - Automatic Temperature Controls, Operation Sequences & Wiring Diagrams, and Control Diagrams hardware and software
 - Motor Starters and Controllers and VFDs
 - Chilled water piping, valves, fittings and specialties
 - Hot water piping, valves, fittings and specialties
 - Pumps, fitting and hydronic specilaties
 - Chiller
 - fans
 - Fan coil units
 - Hangers and Inserts
 - Equipment Supports and Vibration Eliminators
 - Sheet Metal Construction Standards

- Piping Layout (3/8 scale)
 - Ductwork Layout (3/8 scale) including breeching
 - Insulation (piping and ductwork)
 - Piping, Valves, fittings, and Specialties
 - Balancing Reports, Air
- D. The contractor shall, upon award, submit a schedule for the engineers review indicating when each of the above shop drawings shall be submitted. Submittals shall be made in a timely manor as the project progresses in accordance with the Construction manager or General contractor's work schedules. The contractor shall allow sufficient time for the engineers to perform his review. A minimum of 10 business days shall be required. Untimely submittals shall be cause for the owner to make a delay against the contractor.
- E. Demolition, purchase and or installation shall not begin until shop drawings pertaining to the equipment associated with any related potion of the work have been submitted.
- F. Sheet metal shop drawings shall indicate all existing and/or new lights, walls, piping, structural elements, existing work, etc. and dimension locations of ductwork including elevations in relation to these items.
- G. Where shop drawings have been reviewed by the Engineer, such review shall not be considered as a guarantee of measurements or building conditions. Where drawings have been reviewed, said review does not mean that drawings have been checked in detail; said review does not substantiate any quantities and in any way relieve the Contractor from his responsibility nor the necessity of furnishing materials or performing work required by the Contract Drawings and Specifications. It does not relieve the contractor of the responsibility to perform all work to accepted industry standards and in a code compliant manor. Approval of shop drawings containing errors does not relieve the contractor from making corrections at his expense.
- H. Where substitutions are submitted for approval the review shall be for general performance comparison to the specified product. Products shall not be reviewed for size, clearance or coordination with other trades. Coordination with other trades shall be the responsibility of the contractor. And changes to existing conditions or changes required to the work of other trades such as a result of substituted material or equipment approved or not shall be the responsibility of this contractor.

Approval of shop drawings

- I. The Contractor shall be specifically responsible for checking equipment dimensions and clearances and confirming that equipment will fit into the designated space and connect properly to adjoining equipment and/or materials.
- J. Submittals marked "Make Corrections Noted" give authority to proceed in accordance with the notes. However, if drawings are also marked "Amend and Resubmit", corrected drawings must be resubmitted for final review.
- K. Submittals marked "Rejected" do not give authority to proceed with any portion of the work shown there-on. Drawings must be resubmitted.

- L. Submittals marked "Rejected" or "Amend and Resubmit" shall include a specific written response to the engineer's comments. Resubmission of a submittal without a written response to the engineer's comments will be considered incomplete and shall be returned un-reviewed.

2.03 CHARTS AND TAGS

- A. The Contractor shall provide three sets of charts and diagrams of all piping systems installed as part of this work indicating the number and location of valves, controls, etc.
- B. All valves, dampers, and controls shall be designated with brass tags.
- C. Comply with Division 1.

2.04 CODES AND STANDARDS

- A. All equipment and installation methods shall conform to the applicable standards and/or recommendations set forth in the New York State & Local Codes as well as all Codes and Standards listed in the general requirements sections of the specification.

2.05 FEES & PERMITS

- A. The Contractor shall obtain all permits and pay all fees required for his work.

2.06 PAINTING

- A. All motors, fans and all other factory manufactured and assembled apparatus shall be factory coated with one coat of primer and one coat of machinery enamel standard color at the factory and after installation, all finishes shall be cleaned and touched up to repair any damage incurred during construction.
- B. All piping shall be painted in colors conforming with OSHA Standards. All new and existing exposed iron and supplementary dunnage steel shall be finished according to specifications.
- C. All supports, nuts, bolts and hanger fasteners located outside shall be galvanized or nickel plated.

2.07 RIGGING

- A. Furnish all labor, materials and equipment required to rig equipment and materials.
- B. The rigger shall secure any necessary permits and comply with all applicable Federal, State and local safety regulations. A copy of permits to be kept at both the project site and Engineer's Office.
- C. The rigger shall have a minimum of five (5) years of practical experience and hold a master riggers license if required.
- D. The procedure for rigging shall be submitted to the Engineer for review. All possible precautions should be taken to prevent damage to the structure, streets, sidewalks, curbs, lawns, etc.

2.08 CUTTING AND PATCHING

- A. All cutting and patching required for piping, ductwork, control conduits, etc., passing through walls, floors, and roof shall be provided by the this Contractor under this contract unless otherwise noted. This Contractor shall be responsible for any damage done to the structure due to his negligence.
- B. Patching materials and application shall match existing construction.
- C. Where applicable, new holes for piping installation shall be core drilled.
- D. Pipe Sleeves & Fire-stopping
 - 1. Provide for all pipes, conduits ducts, and other elements passing through floors, walls, partitions and structural elements, sleeves as specified. Sleeves shall be of adequate diameter to allow for a minimum of 3/4 inches clear all around sleeve and pipe. When pipe, conduit ducts or other such element penetrates other than fire rated assembly and is insulated, insulation shall pass continuously through sleeves with 1/2 inch clearance between insulation and sleeve.
 - 2. Where pipes, conduits and other such elements penetrate fire rated assemblies, or where holes or voids are created to extend mechanical systems through fire rated assemblies (walls, floors, ceilings, structure, etc.); sleeves and fire-stopping systems shall be installed.
- E. Furnish access doors, to the General Contractor for installation where required in finished walls, partitions and the like for access to junction boxes, controls, valves, etc, concealed behind finished construction.
- F. Submit location drawings and sizes for review prior to installation.

2.09 PROTECTION-COORDINATE WITH DIVISION 1

- A. Special protection is required for installation of a Derrick or other device for rigging purposes. This Contractor shall coordinate with the rigger to facilitate rigging work.
- B. Recommendations and Provisions of ANSI Bulletin A10.2 and OSHA shall be complied with in-so-far as applicable to the work.
- C. The Contractor shall provide temporary partitions or tarpaulins to protect adjacent spaces and/or equipment. He shall be responsible for any damage or injury to person or property of any character resulting from any act, omission, neglect or misconduct in his manner or method of executing his work.
- D. The Contractor shall restore at his own expense such property to a condition similar or equal to that existing before such damage or injury in an acceptable manner.
- E. The Contractor, furthermore, shall conduct his operations in such a manner as to prevent dust and debris from transferring on to adjoining property or into existing spaces.
- F. All openings cut in walls, floors, roof or ceilings of the building, for conduit, pipe, ductwork, etc., shall be closed off with box-type temporary protective enclosures of 1/4" tempered hardboard, except when mechanics are actually working at the particular opening. Enclosures shall be

constructed of fireproof 2x4 frame, four (4) sides covered and made completely dust and water tight.

- G. All finished floor areas through which the contractor must pass with materials or equipment shall be protected with a layer of ¼" hardboard, "Masonite", laid with joints taped together.

2.10 EQUIPMENT SUPPORTS

- A. Provide supplementary steel dunnage, curbs, angle iron stands, etc., to properly set and install all equipment, including supports necessary to properly pitch piping.

2.11 WELDING

- A. Welding and equipment shall conform to the American Welding Society's Code for Welding in Building Construction, latest edition as well as state and local laws and ordinances.
- B. The handling and storage of all welding materials, acetylene and oxygen tanks, burners, and other equipment required for the execution of welding and cutting work shall be subject at all times to the approval of the Owner and/or Architect. All welding materials and gas tanks shall be promptly removed from the premises upon completion of each day's work or stored in a manner satisfactory to the owner. Welding and equipment shall conform to the American Welding Society's Code for Welding in Building Construction, latest edition as well as state and local laws and ordinances.
- C. Provide all temporary ventilation , and ventilation air systems required during welding operations as required by OSHA.

2.12 AS-BUILT DRAWINGS

- A. The Contractor shall provide a complete set of As-Built drawings showing actual installation and locations of all new and existing equipment, piping, and ductwork in the entire building. Schedules shall be revised to indicate actual equipment installed.
- B. As-Built drawings shall be submitted as per contract requirements in accordance with Division 1 and shall be submitted in paper format for review. Accepted as built shall then be submitted in AutoCAD format on hard disc.

PART 3 EXECUTION

3.01 CONDITIONS

- A. Inspection: Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Verify that the work of this Section may be completed in strict accordance with all pertinent codes and regulations, the approved Shop Drawings, and the Manufacturers' recommendations.
- B. Discrepancies: In the event of discrepancy, immediately notify the Engineer. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 INSTALLATION OF EQUIPMENT

- A. Locations: Install all equipment in the locations shown on the approved Shop Drawings except where specifically otherwise approved on the job by the Owner and/or Engineer.
- B. Interferences: Avoid interference with structure, and with work of other trades, preserving adequate headroom and clearing all doors and passageways to the approval of the Engineer.
- C. Inspection: Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, and that all items function properly, and that all adjustments have been made.

3.03 CLOSING-IN OF UNINSPECTED WORK

- A. General: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and accepted by the Engineer and by all other authorities having jurisdiction.
- B. Uncovering: Should any of the work of this Section be covered up or enclosed before it has been completely inspected, tested, and approved, do all things necessary to uncover all such work. After the work has been completely inspected, tested, and approved, provide all materials and labor necessary and make all repairs necessary to restore the work to its original and proper condition at no additional cost to the owner.

3.04 BUILDING ACCESS

- A. The Contractor shall inform himself fully regarding peculiarities and limitations of space available for the passage and installation of all equipment and materials under the Contract.
- B. Verify and coordinate removal of existing construction and/or knock-down of equipment to suit conditions. Special attention should be given to equipment installation. Provide all labor and material to facilitate installation.

3.05 COOPERATION WITH OTHER TRADES PHASING

- A. Cooperate with other trades in order that all systems in the work may be installed in the best arrangements.
- B. Coordinate as required with all other trades to share space in common areas and to provide the maximum of access to each system.
- C. This Contractor shall submit fully coordinated shop drawings showing all piping, ductwork and equipments, as well as relevant work of all other trades such as light, conduits, structural and steel, which may impact the final size or placement of piping, ductwork, equipment, diffusers and grilles.
- D. The work shall be scheduled and phased in accordance with the requirements of the contract and the client. Prior to the commencement of work the HVAC contractor shall submit a schedule in writing to the Architect and owner for approval. There shall be no shut downs of any systems without prior written approval from the owner. The contractor shall include in his bid all costs associated with providing temporary piping controls, ductwork and fans and air conditioning units to maintain operations in the phase II area while work is being performed on the Phase I area. It shall also be noted that ductwork, piping and controls will have to be extended through

the phase II work areas in order to reach the area(s) under construction in phase I as part of this work. The contractor shall include in his bid all provisions to perform such phasing work.

3.06 CLEANING

- A. It is the intent of the contract documents that all work, including the inside of equipment be left in a clean condition. All construction dirt shall be removed from material and equipment.
- B. All removed items shall be taken off the premises and discarded in a manner satisfactory to the Owner.

3.07 COMPLETENESS

- A. It is the intent of the contract documents to provide complete systems. Completeness shall mean not only that all material and equipment has been installed properly, but that all material and equipment is installed, adjusted, and operating as per the design intent in the opinion of the Engineer and in accordance with generally accepted industry good practice.
 - A. Upon completion of all phases of work or before there is any danger from freezing the contractor fill the heating and cooling systems with a 35% glycol solution. Furnish 15 extra gallons in a steel drum for storage on site and future use by the owner.

3.08 FIRE PREVENTION DURING HOT WORK

- A. Before starting operations, the Contractor shall furnish trained personnel to provide fire watches for locations where hot work is to be performed. One fire watcher may observe several locations in a relatively small contiguous area. Contractor shall furnish suitable type, fully-charged, operable portable fire extinguisher to each fire watcher.
- B. The Contractor shall provide fire watchers who know how to operate the fire extinguisher, how to turn on a fire alarm and how to summon the fire department.
- C. Before starting operations, take suitable precautions to minimize the hazard of a fire communicating to the opposite side of walls, floors, ceilings and roofs from the operations.

3.09 SAFETY MEASURES

- A. Hot work shall not be done in or near rooms or areas where flammable liquids or explosive vapors are present or thought to be present. A combustible gas indicator (explosimeter) test shall be conducted to assure that each area is safe. The Contractor is responsible for arranging and paying for each test.
- B. Insofar as possible, the Contractor shall remove and keep the area free from all combustibles, including rubbish, paper and waste within a radius of 25 feet from hot operations.
 - 1. If combustible material cannot be removed, the Contractor shall furnish fireproof blankets to cover such materials. At the direction of the owner floors, walls, and ceilings of combustible material shall be wetted thoroughly with water before, during, and after operations sufficiently to afford adequate protection.

- C. Where possible, the Contractor shall furnish and use baffles of metal or gypsum board to prevent the spraying of sparks, hot slag and other hot particles into surrounding combustible material.
- D. The Contractor shall prevent the spread of sparks and particles of hot metal through open windows, doors, and holes and cracks in floors, walls, ceilings and roofs.
- E. Cylinders of gas used in hot work shall be placed a safe distance from the work. The Contractor shall provide hoses and equipment free of deterioration, malfunction and leaks. Suitable supports shall be provided to prevent accidental overturning of cylinders. All cylinder control valves shall be shut off while in use with the gas pressure regulator set at 15 psi or less.
- F. When hot work operations are completed or ended for the day, each location of the days work shall be inspected by the Contractor 30 to 60 minutes after completion of operations to detect for hidden or smoldering fires and to ensure that proper housekeeping is maintained. Contractor shall cleanup the area of work at the end of each shift or workday.
- G. Where sprinkler protection exists, the sprinkler system shall be maintained without interruption while operations are being performed. If operations are performed close to automatic sprinkler heads, gypsum board sheets or damp cloth guards may be used to shield the individual heads temporarily. The heads shall be inspected by the Contractor immediately after hot work operations cease, to ensure all materials have been removed from the heads and that the heads have not been damaged.
- H. Suitable type, fully-charged, operable portable fire extinguisher shall be available at all times during hot work operations.
- I. If any of the above safeguards are not employed, or are violated, the Contracting owners Representative may, by written notice, stop the work until compliance is obtained. Such stoppage shall not relieve the Contractor from performing his work within the Contract period for the Contract price.

3.10 USE OF OWNERS EQUIPMENT

- A. The contractor shall not use any the owner's HVAC system or equipment, new or existing, for any purpose. The contractor shall provide temporary hvac equipment, ductwork, power, and controls for use during construction for the purpose of ventilation, or heating during the construction process. All such equipment, ductwork, power, and controls shall be removed at the completion of work.
- C.

END OF SECTION

SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Common requirements for electric motors furnished on equipment specified in other Sections, including single phase and three phase electric motors.

1.02 RELATED SECTIONS

- A. Division 24 - Equipment Wiring Systems: Electrical characteristics and wiring connections.

1.03 REFERENCES

- A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- C. NEMA MG 1 - Motors and Generators.
- D. NFPA 70 - National Electrical Code.

1.04 REGULATORY REQUIREMENTS

- A. Conform to UL Component Recognition for appropriate sizes.
- B. Conform to NFPA 70 applicable electrical code, Underwriters Laboratories, Inc., and NEMA
- C. Conform to New York City Energy Conservation Code.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weatherproof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.06 WARRANTY

- A. Provide five year manufacturer warranty for all motors larger than ½ horsepower.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Gould.

- B. Century.
- C. General Electric.
- D. Square D

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. All electric motors of sizes and types as specified for driving mechanical equipment shall be provided under this section.
- B. Electrical Service: All motors shall be 60 Hertz unless otherwise noted. Refer to Electrical Specifications for required electrical characteristics.
- C. Motors: Design for continuous operation in 40° C environment, and for temperature rise in accordance with ANSI/NEMA MG limits for insulation class, Service Factor, and motor enclosure type. Motors shall be of sufficient size for duty to be performed.
- D. Visible Nameplate: Indicating manufacturer's name and model number, motor horsepower, RPM, frame size, voltage, phase, cycles, full load amps, insulation system class, service factor, maximum ambient temperature, temperature rise at rated horsepower, minimum efficiency, power factor.
- E. Electrical Connection: Conduit connection boxes, threaded for conduit. For fractional horsepower motors where connection is made directly, provide screwed conduit connection in end frame. Size motor boxes to receive motor feeders and ground cable indicated on electrical drawing schedules.
- F. Suitable starting and controlling equipment and devices shall be furnished and installed as specified hereinafter and as shown on the Drawings. The starting equipment shall be arranged, generally, in control groups, or in certain cases, as isolated combination starters as specified or indicated. The Heating Ventilating and Air Conditioning Sequences of Operation, drawings and specifications shall be referred to for the manner of control, operation and monitoring of motors and the electrically operated equipment.
- G. A starter and disconnect switch or combination motor starter disconnect shall be provided for every motor and each and every electrically operated piece of equipment by this contractor except where complete starters and controls are furnished by the manufacturer of the motor or piece of equipment. Starters shall be internally wired to provide the required control operation and monitoring. All control devices such as push buttons, break-glass stations, alternators, relays, pilot lights, etc., shall be provided as required for operation of mechanical equipment. All roof top and remotely located equipment shall have remote starters as located on plan and shall have local disconnect switches. All equipment located in equipment rooms can use combination starters/disconnects located within line of sight of controlled equipment. All starters and disconnect switches shall be in enclosures suitable for the environment in which they are installed. Starters and disconnect switches located in machine rooms shall use NEMA 1. Starters and disconnect switches located outdoors shall use NEMA 4x. Starters and disconnect switches located in machine rooms which are subject to potential water damage shall use NEMA 2
- H. Starting equipment and devices specified in this section (and section 23 29 13 Variable Frequency Controllers), shall be furnished by the mechanical subcontractor and shall be installed by the Electrical subcontractor. In general the mechanical subcontractor shall

furnish all motor starters and disconnect switches except where they are an integral part of a motor control center, in this case starters and disconnects shall be provided, (furnished and installed), by the electrical contractor. The Electrical subcontractor shall also provide all wiring necessary to supply power to the electric motors specified under this section, including connections from the starters to the motors. Starters and disconnects shall also include variable frequency drives.

- I. The Mechanical Contractor shall furnish and install all wiring between control devices and controlled equipment furnished under this Section, including interlock control wiring between motor starters, and all automatic temperature control wiring. All wiring shall be installed in conformance with applicable codes and the requirements of the Electrical Division of the Specifications.
- J. The Electrical Contractor shall furnish a 120 volt power source to temperature control panels and equipment requiring a separate 120 volt control power source. Power for control circuits for all devices connecting to motor starters shall be obtained from 120-volt control transformers provided in each starter operating at other than 120 volts. Provide transformers for all low voltage control systems as required.
- K. Furnish detailed composite wiring diagrams and such other information necessary to assure the proper connection, operation and control of motorized equipment, including interlocks, automatic controls, safety controls and all auxiliary circuits.
- L. All control units shall be furnished with a nameplate indicating which device or equipment it controls, the voltage. Additional nameplates on each push button, selector switch and pilot light indicating their functions shall be provided. Nameplates shall be laminated phenolic with white letters on black background, minimum 2" high.
- M. All motors supplied either with equipment or installed separately that are to be used in conjunction with variable frequency drive shall be inverter duty motors.

2.03 SINGLE PHASE POWER - SPLIT PHASE MOTORS

- A. Starting Torque: Less than 150 percent of full load torque.
- B. Starting Current: Up to seven times full load current.
- C. Breakdown Torque: Approximately 200 percent of full load torque.
- D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.04 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

- A. Starting Torque: Exceeding one fourth of full load torque.
- B. Starting Current: Up to six times full load current.

- C. Multiple Speed: Through tapped windings.
- D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.05 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve ball bearings.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.06 THREE PHASE POWER - SQUIRREL-CAGE MOTORS

- A. Starting Torque: Between 1 and 1-1/2 times full load torque.
- B. Starting Current: Six times full load current.
- C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
- D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B energy efficient motors.
- E. Insulation System: NEMA Class B or better.
- F. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- G. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay with wiring to terminal box.
- H. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum AFBMA 9, L-10 life of 200,000

hours. Calculate bearing load with NEMA minimum V-belt pulley with belt centre line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

- I. Sound Power Levels: To NEMA MG 1.
- J. Part Winding Start Where Indicated Above 254T Frame Size: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.
- K. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.
- L. Energy Efficient Motors – Premium efficiency electric motors shall be provided for all polyphase drip roof and totally enclosed motors one horsepower and above. Motor shall be a standard product of a specified alternate motor manufacturer and shall have the following minimum guaranteed full load efficiencies at 1800 rpm. Certification of motor efficiency shall be submitted with equipment shop drawings. Motors for different rpm's shall be of same construction and comparable efficiency as 1800 rpm motors.

<u>HP</u>	<u>Minimum Efficiency %</u>	<u>HP</u>	<u>Minimum Efficiency %</u>
1	78.5	20	91.0
1-1/2	81.5	25	93.0
2	81.5	30	93.0
3	84.0	40	94.0
5	87.0	50	94.0
7-1/2	89.0	60	95.0
10	90.0	75	95.0
15	90.0	-	-

2.07 POWER FACTOR CORRECTION

- A. A capacitor for each three phase, single speed motor rated 3 HP or larger shall be provided to correct the full load power factor to 95%. The capacitor shall be mounted at the motor for connection across the motor terminals by Electrical Contractor.
- B. Capacitors
 - 1. Capacitors shall be totally enclosed, fused and with discharge resistors.
 - 2. Capacitors based on nominal motor RPM shall be provided in accordance with the following table to correct power factor to 95% and verify sizes with motor manufacturer.

<u>Motor HP</u>	<u>Capacitor KVAR 3600 RPM Motor</u>	<u>Capacitor 188 RPM</u>
3	1.5	1.5
5	2	2
7-1/2	2.5	2.5
10	3	3

15	4	4
20	5	5
25	6	6
30	7	7
40	9	9
50	12	11
60	14	14
75	17	16

2.08 STARTERS

A. General

1. See specification Section 16485 and Division 1 for additional information.
2. Starters for motors operating at 120 volts shall be manual starters unless otherwise indicated. Starters for motors operating at other than 120 volts shall be magnetic starters.
3. All starters shall be enclosed. Enclosures shall be surface mounted NEMA 1 unless otherwise indicated.
4. Where weatherproof starters are required, the enclosure shall be NEMA 4.
5. It shall be verified that the correct overload heaters have been installed in the starter before energizing any motor. Sizing shall be based on motor nameplate current and taking into account any reduction in current due to power factor correction.
6. Alternate Manufacturers –
 - Allen-Bradley
 - Crouse-Hinds Co.
 - Cutler-Hammer, Inc.
 - General Electric Co.
 - Square D Co.
 - Westinghouse Electric Corp.

B. Manual Starters

1. Two-pole, toggle operated, thermal overload device in each phase leg, handle guard for padlocking toggle handle and with indicated control and signal devices.
2. Where a motor is controlled automatically by an interlock or pilot device, a “HAND-OFF-AUTO” switch shall be provided in the starter cover. Where the rating of the interlock or pilot device is inadequate to control the motor currents directly, a properly rated contactor shall be provided between the controlling device and the motor.
3. An “ON” pilot light shall be provided in the starter cover.

C. Magnetic Starter

1. Starters shall be sized in accordance with NEMA standards and the following table except that starters shall not be smaller than NEMA size 0. Starters shall be provided with one N.O. electrical holding interlock, under voltage protection and

two additional auxiliary contacts within the same enclosure. NEMA size starters shall be provided as follows:

<u>Starter Size</u>	<u>Maximum HP @ 460 Volts</u>
0	5
1	10
2	25
3	50

2. All starters shall be combination type with the starter and disconnect in the same enclosure. All starters shall be Type 2 coordination protected. Fuses shall be Bussman "Low Peak" type or equal sized at 125% of motor nameplate rating. Verify and coordinate requirements for fused disconnect switches with the Electrical Contractor prior to ordering starters.
3. Provide S.S.P.B. or H-O-A switches and pilot light in covers as required to facilitate control operation sequences.
4. All three pole starters, either integral to equipment or field supplied, shall contain voltage fault protection specifically designed to protect all motors and associated control circuits from failure or damage due to voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. The starter shall be arranged to monitor critical faults including phase loss or reversal, and when detected, de-energize the load. It shall monitor non-critical faults including high/low voltage , voltage unbalance and when detected, after a time delay de-energize the load."
5. Where starters are not integral to equipment and are furnished and installed separately from equipment by the contractor, provide a 3 phase line voltage monitor by ICM Controls model 450 or approved equal. Unit shall be installed in the motor starter or in a separate enclosure with the same rating as the starter. It shall be arranged to monitor critical faults including phase loss or reversal, and when detected, de-energize the load. It shall monitor non-critical faults including high/low voltage , voltage unbalance and when detected, after a time delay de-energize the load.

2.09 VFD Motors:

- A. All motors for pumps and fans shall be in conjunction with variable frequency drives shall be premium efficiency, "inverter duty" rated.

PART 3 EXECUTION

3.01 APPLICATION

- A. Motors drawing less than 250 Watts and intended for intermittent service may be germane to equipment manufacturer and need not conform to these specifications.
- B. Motors one (1) HP and larger shall be premium energy efficient type.

- C. Motors shall be open drip-proof type, except where specifically noted otherwise.
- D. Motors 5 HP and larger shall be premium energy efficient type and shall meet all requirements of NYSERDA prescriptive incentives as well as the applicable energy codes.
- E. Single phase motors for shaft mounted fans shall be split phase type.
- F. Single phase motors for fans shall be capacitor start, capacitor run type.

END OF SECTION 23 05 13

SECTION 23 05 16
EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.
- C. Pipe loops, offsets, and swing joints.
- D. Guides.

1.02 RELATED SECTIONS

- A. Section 23 22 13 – Hydronic Piping.
- B. Section 23 22 14 – Hydronic Piping and Specialties
- C. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.03 REFERENCES

- A. MIL-E-17814E - Expansion Joints, Pipe, Slip-Type, Packed.

1.04 PERFORMANCE REQUIREMENTS

- A. Provide structural work and equipment required to control expansion and contraction of piping. Verify that anchors, guides, and expansion joints provided, adequately protect system.
- B. Expansion Calculations:

1. Installation Temperature: 40° F for hot water and 95° F for chilled water
2. Hot Water Heating: 220 degrees F.
3. Chilled water piping 44 degrees F
4. Domestic Hot Water: 140 degrees F.
5. Safety Factory: 30 percent.

1.05 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data:

1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

C. Design Data: Indicate selection calculations.

D. Manufacturer's Installation Instructions: Indicate special procedures, and external controls.

1.06 WARRANTY

A. Provide five-year warranty.

B. Warranty: Include coverage for leak free performance of packed expansion joints.

1.07 EXTRA MATERIALS

A. Furnish under provisions of division 01.

B. Provide two 12-ounce containers of packing lubricant and cartridge style grease gun.

PART 2 PRODUCTS

2.01 FLEXIBLE PIPE CONNECTORS

A. Steel Piping:

1. Manufacturers:

- a) Metroflex Company.
- b) Advanced Thermal Systems, Inc.
- c) Mason Industries.

2. Inner Hose: Stainless Steel.

3. Exterior Sleeve: Braided.

4. Pressure Rating: 125 psig and 450 degrees F and 200 psig and 250 degrees F.

B. Copper Piping:

1. Manufacturers:

- a) Metroflex Company.
- b) Advanced Thermal Systems, Inc.
- c) Mason Industries.

2. Inner Hose: Bronze

3. Exterior Sleeve: Braided bronze.

4. Pressure Rating: 125 psig and 450 degrees F and 200 psig and 250 degrees F.

C. Flexible stainless steel and bronze hoses shall have stainless steel braid or bronze braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples. Minimum lengths shall be as tabulated:

Flanged		Male Nipples	
Pipe size(in)	Length (in)	Pipe size (in)	Length (in)
3	14	½	6
4	15	¾	6
5	19	1	8
6	20	1 ½	8
8	22	2	10
10	26	2 1/2	10
12	28		
14	30		
16	32		

Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible. Hoses shall be type BSS as manufactured by Mason Industries, Inc.

2.02 EXPANSION JOINTS

- A. Copper Piping: All bronze type with two-ply bronze bellows, anti-torque device limit stops, internal guides, and solder joint end.
- B. Use joints suitable for minimum 125 psi and 400° F, and 200 psi and 250° F.
- C. Copper or Steel Piping 2" and Under: Low pressure compensators with two-ply bronze bellows suitable for minimum 250 psi pressure and 250° F, and maximum ½" expansion.
- D. Copper or Steel Piping 2" and Over: Copper type with packed sliding sleeve suitable for minimum 250 psi working pressure and 250° F.

2.02 PACKLESS EXPANSION JOINTS

- A. Metal, Compensator Packless Expansion Joints :
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flexicraft Industries.

- b. Mason Industries, Inc.
- c. Metraflex Company (The).
- 2. Minimum Pressure Rating: 175 psig, unless otherwise indicated.
- 3. Description: Totally enclosed, externally pressurized, multi-ply bellows isolated from fluid flow by an internal pipe sleeve and external housing.
- 4. Joint Axial Movement: 2 inches of compression and 1/2 inch of extension.
- 5. Configuration for Copper Tubing: Multi-ply, phosphor-bronze bellows with copper pipe ends.
 - a. End Connections for Copper Tubing NPS 2 and Smaller: Solder joint or threaded.
 - b. End Connections for Copper Tubing NPS 2-1/2 to NPS 4 Threaded.
- 6. Configuration for Steel Piping: Multi-ply, stainless-steel bellows; steel-pipe end connections; and carbon-steel shroud.
 - a. End Connections for Steel Pipe NPS 2 and Smaller: Threaded.
 - b. End Connections for Steel Pipe NPS 2-1/2 to NPS 4 Flanged Threaded Welded.

2.03 ACCESSORIES

A. Pipe Alignment Guides:

1. Manufacturers:

- a) Metroflex Company.
- b) Advanced Thermal Systems, Inc
- c) Mason Industries.

- 2. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Accomplish structural work and provide all equipment required to control expansion and contraction of piping, loops, pipe offsets, and swing joints. Provide expansion joints or loops where required.
- B. Install in accordance with manufacturer's instructions.
- C. Construct spool pieces to exact size of flexible connection for future insertion.
- D. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.
- E. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- F. Rigidly anchor pipe to building structure where necessary. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus. Provide supplemental steel where necessary.
- G. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required indicated.
- H. Provide expansion loops as required.
- I. Provide a minimum of two guides on each side of each expansion loop or device. Locate the first guide a maximum distance of four diameters from the loop or device.
- J. Submit details of anchor and guide assemblies for review.

END OF SECTION

November 6, 2020
Contract No. 16-529

Main House Renovations Lasdon Park
Arboretum and Veterans Memorial

SECTION 23 05 19
METERS AND GAGES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pressure gages and Pressure gage taps.
- B. Thermometers and thermometer wells
- C. Static pressure gages.
- D. Filter gages.

1.02 RELATED SECTIONS

- A. Section 23 22 13 – Hydronic Piping.
- B. Section 23 22 14 – hydronic specialties.
- C. Section 23 09 00 - Instrumentation and Control Elements for HVAC.

1.03 REFERENCES

- A. Division 1 - Reference Standards: Requirements for references and standards.
- B. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
- C. ASME MFC-3M - Measurement of fluid flow in pipes using orifice, nozzle and venturi.
- D. ASTM E1 - Standard Specification for ASTM Thermometers
- E. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers
- F. UL 393 - Indicating Pressure Gauges for Fire-Protection Service
- G. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service.

1.04 SUBMITTALS FOR REVIEW

- A. Division 1 - Submittals: Procedures for submittals.
- B. Product Data: Provide list which indicates use, manufacturer, operating range, total range, and location for manufactured components.
- C. Samples: Submit two of pressure gages, thermometers.

1.05 SUBMITTALS AT PROJECT CLOSEOUT

- A. Division 1 - Contract Closeout: Procedures for submittals.

- B. Project Record Documents: Record actual locations of components and instrumentation
- C. Operation and Maintenance Data: Include instructions for calibrating instruments.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Division 1 - Material and Equipment: Environmental conditions affecting products on site
- B. Do not install instruments when areas are under construction, except for required rough-in, taps, supports, and test plugs.

1.07 MAINTENANCE PRODUCTS

- A. Division 1 - Operation and Maintenance Data
- B. Do not install instrumentation when areas are under rough construction, except for required rough-in, taps, supports, and test plugs. Instruments should be installed immediately prior to equipment start-up.
- C. Supply two bottles of red gage oil for static pressure gages.

1.08 EXTRA MATERIALS

- A. Division 1 - Contract Closeout
- B. Supply two pressure gages with pulsation damper.

PART 2 PRODUCTS

2.01 Manufacturer:

- A. Terice
- B. Weksler
- C. Taylor
- D. Other manufacturers offering equivalent products.

2.02 PRESSURE GAUGES:

ASME B40.1, 3-1/2" diameter drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background, one percent mid-scale accuracy, scale calibrated in psi.

2.03 PRESSURE GAGE TAPINGS

- A. Gauge Cock: Tee or ball valve, brass for maximum 150 psig.

2.04 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

- A. A. Manufacturers:

1. Terice, H. O. Co.
2. Weiss Instruments, Inc.
3. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

- B. Case: Die-cast aluminum or brass, 9 inches long.
- C. Tube: Red or blue reading, organic-liquid filled, with magnifying lens.
- D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.
- E. Window: Glass.
- F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.
- G. Stem: Copper-plated steel, aluminum, or brass for thermowell installation and of length to suit installation.
- H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

1.2 2.05 DUCT-TYPE, LIQUID-IN-GLASS THERMOMETERS

- A. A. Manufacturers:
 1. Miljoco Corp.
 2. Palmer - Wahl Instruments Inc.
 3. Terice, H. O. Co.
 4. Weiss Instruments, Inc.
- B. B. Case: Die-cast aluminum, 9 inches long.
- C. C. Tube: Red or blue reading, organic filled, with magnifying lens.
- D. D. Tube Background: Satin-faced, non-reflective aluminum with permanently etched scale markings.
- E. E. Window: Glass or plastic
- F. F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device
- G. G. Stem: Metal, for installation in mounting bracket and of length to suit installation.
- H. H. Mounting Bracket: Flanged fitting for attachment to duct and made to hold thermometer stem.

- I. J. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range, scale calibration in degF.

2.05 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain. Provide extension necks beyond insulation.
- B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.06 TEST PLUGS

- A. Test Plug: 1/4 inch or 1/2 inch stainless steel fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Neoprene core for temperatures up to 200 degrees F.
- B. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gage, one gage adapter with 1/8 inch probe, two 1-1/2" dial thermometers.

2.07 STATIC PRESSURE GAGES

- A. Dial Gages: 3-1/2" diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment with tubing, static pressure tips.
- B. Inclined Manometer: red liquid on white background with black figures, front recalibration adjustment with tubing, static pressure tips.
- C. Static pressure gauges shall be calibrated in inches water gauge and have ranges suitable for service intended.

2.08 FILTER GAUGES

- A. Magnahelic gauge with the cast aluminum housing and baked enamel finish suitable for outdoor installation. Provide optional signal flag for visual reference to maximum pressure drop.
- B. Accessories: Brass or copper static pressure tips with integral compression fittings, aluminum tubing, and vent valves.

2.09 DIAL THERMOMETERS

- A. ASTM, 3-1/2 inch diameter dial in drawn steel with enamel finish case, vapor or liquid actuated with brass or copper bulb, copper or bronze braided capillary, white with black markings and black pointer glass lens, 2 percent mid-scale accuracy, calibrated in degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Manufacturer's instructions

- B. Install pressure gages on pump and coils as per details, with taps before and after strainers and on suction and discharge of pumps.
- C. Install gage taps in piping; as per specifications.
- D. Install pressure gages with pulsation dampers. Provide gauge cock to isolate each gage.
- E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- F. Install thermometers in air duct systems on flanges.
- G. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets. Refer to Sections 230901.
- H. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.
- I. Coil and conceal excess capillary on remote element instruments.
- J. Install static pressure gages to measure across filters and filter banks, (inlet to outlet). On multiple banks, provide manifold and single gage.
- K. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- L. Install gages and thermometers in locations where they are easily read from normal operating level.
- M. Locate test plugs adjacent to thermometers and thermometer sockets and to pressure gages and pressure gage taps.

3.02 SCHEDULES

A. Pressure Gages.

- 1. In-line Pumps – inlets and outlets
- 2. Base mounted Pumps – inlets and outlets.
- 3. Fuel Transfer Pump – before strainer, and on suction and discharge.
- 4. Expansion tanks
- 5. Pressure reducing valves, inlet and outlet.
- 6. Control valves 3/4 inch & larger - inlets and outlets.
- 7. Coils - inlets and outlets.
- 8. Boiler and chiller - inlets and outlets.
- 9. Chemical Pot Feeder.
- 10. Otherwise as noted on plans and in details.

B. Thermometers:

- 1. Headers to central equipment
- 2. Boilers and chiller - inlets and outlets
- 3. Coils – inlets and outlets
- 4. Chillers – inlets and outlets

5. Heat exchangers – inlets and outlets
6. Otherwise as noted on plans and in details

C. Static Pressure and Filter Gages.

1. All A.C. H&V and HVAC unit filter banks.
 2. Unitary filter sections.
 3. Supply fan discharge and inlet
 4. Return Fan Inlet discharge
 - 5.

D. Dial Thermometers:

1. Each supply air zone or SA main
 2. Outside air
 3. Return air
 4. Mixed air

END OF SECTION

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Equipment supports.

- B. Related Sections:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
3. Section 230548.13 "Vibration Controls for HVAC" for vibration isolation devices.
4. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
 1. Trapeze pipe hangers.
 2. Metal framing systems.
 3. Pipe stands.
 4. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 1. Detail fabrication and assembly of trapeze hangers.
 2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.

4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel or stainless steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 1, steel pipe hanger except hanger is made of fiberglass or fiberglass-reinforced resin.
2. Hanger Rods: Continuous-thread rod, washer, and nuts made of stainless steel.

B. Strap-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 9 or Type 10, steel pipe hanger except hanger is made of fiberglass-reinforced resin.
2. Hanger Rod and Fittings: Continuous-thread rod, washer, and nuts made of stainless steel.

2.4 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. B-line, an Eaton business.
 - b. Flex-Strut Inc.

- c. Thomas & Betts Corporation; A Member of the ABB Group.
 - d. Unistrut; Part of Atkore International.
 - e. Wesanco, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
 3. Standard: MFMA-4.
 4. Channels: Continuous slotted steel channel with inturned lips.
 5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
 6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.
 7. Metallic Coating: Electroplated zinc, Hot-dipped galvanized, Mill galvanized, In-line, hot galvanized, or Mechanically-deposited zinc.
 8. Paint Coating: Epoxy or Alkyd.
 9. Plastic Coating: PVC or Polyurethane.
 10. Combination Coating: .

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anvil International.
 - b. ERICO International Corporation.
 - c. PHD Manufacturing, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.
7. Coating: Zinc, Paint or PVC.

2.5 FIBERGLASS STRUT SYSTEMS

- A. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- B. Description: Shop- or field-fabricated pipe-support assembly similar to MFMA-4 for supporting multiple parallel pipes.
 1. Channels: Continuous slotted fiberglass channel with inturned lips.
 2. Channel Nuts: Fiberglass nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.6 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Clement Support Services.
 2. ERICO International Corporation.
 3. National Pipe Hanger Corporation.
 4. Pipe Shields Inc.
 5. Piping Technology & Products, Inc.
 6. Rilco Manufacturing Co., Inc.
- B. Insulation-Insert Material for Hot and cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.7 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.8 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand:
 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One or more; plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.9 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.10 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
 2. Design Mix: 5000-psi, 28-day compressive strength.
- C. Flashing;
Metal Flashing: 26gage galvanized steel.
1. Metal Counter-flashing: 22 gage thick galvanized steel.
 2. Flexible Flashing: 47 mil thick sheet butyl or other material compatible with roofing. Verify with roofing manufacturer.
 3. Caps: Steel, 22-gage minimum; 16 gage at fire resistant elements.
- D. Sleeves:
1. Ductwork Sleeve 18 gauge Installation and Closure for Fire Rated Walls and Floors: Fire damper assembly with continuous angles on all sides as per NFPA-90A requirements.

2. Provide and install sleeves for all penetrations in accordance with Division 1.
- E. Escutcheons;
1. Chrome plated cast brass escutcheons with set screws on all exposed piping at wall penetrations in finished spaces.
- F. Hanger Rods:
1. Hanger Rods: Hot rolled steel threaded both ends, threaded one end, or continuous threaded. In accordance with the following schedule.

HANGER ROD SIZE SCHEDULE	
Pipe Size (in)	Min Rod Dia (in)
¾" to 2"	3/8"
½" to 3-1/2"	½"
4" to 5"	5/8"
6"	¾"
8" to 12"	7/8"
14"	1"
16" to 18"	1-1/8"
20"	1-1/4"
24"	1-1/2"
30"	1-7/8"

2. Hanger spacing shall be in accordance with the following schedule for maximum allowable distance. Provide hanger all changes in direction.

PIPE SUPPORT SPACING SCHEDULE		
Pipe Material/ Size (in)	Maximum Horizontal Spacing (ft)	Maximum Vertical Spacing (ft)
Steel		
Up to 1 ¼"	8	15
1 ½" to 2 ½"	10	15
3" and over	12	15
Copper Pipe	8	10
Copper Tubing		
Up to 1 ¼"	6	10
1 ½" and over	8	10
PVC / HDPE		
Up to 1"	3	10
1 1/4" and over	4	10

3. Fiberglass piping supports spacing shall be in accordance with the manufactures guidelines.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.
- D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled fiberglass struts.
- F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- G. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- H. Pipe Stand Installation:
 - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 - 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.
- I. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

- J. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- K. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- L. Install lateral bracing with pipe hangers and supports to prevent swaying.
- M. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- N. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- P. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles on all piping with roller hangers installed outside of insulation. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier not on roller hangers. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply cold galvanizing-repair paint to comply with ASTM A 780. ZRC cold galvanizing compound

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports or metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 5. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 6. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 7. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 - 8. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.

9. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 10. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 11. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 12. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
 13. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 14. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 15. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 9. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 10. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 11. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 12. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 13. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

- a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- R. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.7 MISCELLANEOUS:

- A. Equipment bases and supports.
- 1. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment. Changers edges all four side. Provide dowels into concrete floor for equipment that is seismically braced.
 - 2. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment. Provide for all equipment, pumps, air handling units, etc.
 - 3. Refer to 23 0548 Vibration controls for HVAC piping and piping and equipment for vibration inertia bases.
 - 4. Construct supports of steel members. Brace and fasten with flanges bolted to structure. Provide rigid anchors for pipes after vibration isolation components are installed.
- B. Flashing;
- 1. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
 - 2. Flash piping projecting above finished roof surface with prefabricated steel reinforced boot and counter flashing sleeve.
- C. Sleeves;
- 1. Sleeves are required for all piping passing through walls and/or slabs. Sleeve diameter to be large enough to accommodate insulated piping.
 - 2. Sleeves through interior non-fire rated walls are to have annular space between pipe and sleeve filled with materials specified in Division 1.
 - 3. Sleeves thru fire rated walls to have annular space filled with fire stopping wrapping strips and expanding caulking applied with a caulking gun for a minimum depth of 3" or in another manner suitable for the application as recommended by the manufacturer. See Division 1.
- D. Escutcheons:
- 1. Provide escutcheons on all wall pipe penetrations that are visible outside MER spaces. All escutcheons shall be chrome plated.

END OF SECTION 230529

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Identification of mechanical products installed under Division 23.

1.02 REFERENCES

- A. ASME A13.1 – Scheme for the Identification of Piping Systems

1.03 SUBMITTALS

- A. Submittals as per contract requirements.
- B. See Division 1 list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Manufacturer's Instructions: Indicate installation instructions, special procedures, and installation.
- E. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.
- F. Valve Tag chart.

PART 2 PRODUCTS

2.01 NAMEPLATES, TAGS, MARKERS, ETC

- A. Manufacturer: W.H. Brady Co., Signmark Div
- B. Acceptable manufacturers offering equivalent products
 - 1. Atlantic Engraving Company.
 - 2. Seton Name Plate Co.
 - 3. MSI Services
 - 4. Substitutions as per Contract Requirements.
- C. Description: Nameplates should be as specified in Division 1.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials
- B. Prepare surfaces in accordance with contract requirements.

3.02 INSTALLATION

- A. Install tags, markers, etc. in conformance with Division 1.
- B. Unless otherwise specified, color shall conform with ANSI/ASME A13.1
- C. Install identifying devices after completion of coverings and painting.
- D. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- E. Install labels with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer. For unfinished cloth covering, apply paint primer before applying labels.
- F. Install tags using corrosion resistant chain. Number tags consecutively by location.
- G. Apply stencil painting in accordance with contract requirements.
- H. Identify all equipment, including pumps, air handlers, air cooled condensers, boilers, chillers, pumps, packaged AC units, and hot water heater with nameplates. Small devices, such as in-line pumps, may be identified with metal tags. Identify service of all air handling units, ac units split and packaged units. I.E. Ground floor offices.
- I. Identify control panels and major control components outside panels with nameplates.
- J. Identify valves in main and branch piping with brass tags. Main shutoff valves for boiler shall be furnished with special wording as required by ASME IV HG 710.5 "Supply or Return Valve No. X - Do Not Close Without Also Closing Supply or Return Valve No. Y". Tags shall be provided for all new and existing HVAC and related systems valves. Including; heating water, chilled water, CW make up, fuel oil and drain. This shall apply to new and existing valves and on re-piped existing equipment such as the fuel oil system.
- K. Tag automatic controls, instruments, and relays. Key to control schematic.
- L. Identify piping, concealed or exposed, with markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction. Labeling shall be in conformance with OSHA and ANSI A13.1.
- M. Identify all ductwork every 20' with flow arrows and unit or air handler served as well as service, such as SUPPLY AIR, RETURN AIR, EXHAUST AIR. Etc

- N. Provide permanent labels for all controls and limits which state function of each control and control set-points.

3.03 SCHEDULE

- A. Provide valve chart and schedule minimum of 8.5" x 11" in aluminum frame with clear laminate face. Install in the boiler room or at location as directed by the facilities. Indicate Valve #, size, Service and N.O. or N.C.

VALVE TAG SCHEDULE			
No.	size	Service	N.O./N.C.

The chart shall contain all new and existing boiler plant and related systems valves, new or existing. Including; steam condensate, and CW make up, fuel oil and drain.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - b. Dual-duct systems.
 - c. Variable-air-volume systems.
 - d. Multizone systems.
 - e. Induction-unit systems.
2. Balancing Hydronic Piping Systems:
 - a. Constant-flow hydronic systems.
 - b. Variable-flow hydronic systems.
 - c. Primary-secondary hydronic systems.
3. Testing, Adjusting, and Balancing of Equipment:
 - a. Chillers.
 - b. Boilers.
 - c. Heat-transfer coils.
4. Testing, adjusting, and balancing existing systems and equipment.
5. Control system verification.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

- G. TDH: Total dynamic head.

1.4 PREINSTALLATION MEETINGS

- A. TAB Conference: If requested by the engineer, conduct a TAB conference at Project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.
1. Minimum Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Needs for coordination and cooperation of trades and subcontractors.
 - d. Proposed procedures for documentation and communication flow.

1.5 ACTION SUBMITTALS

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Certified TAB reports.
- D. Sample report forms.
- E. Instrument calibration reports, to include the following:
1. Instrument type and make.
 2. Serial number.
 3. Application.
 4. Dates of use.
 5. Dates of calibration.

1.7 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC NEBB or TABB.
1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC or NEBB or TABB.
 2. TAB Technician: Employee of the TAB specialist and certified by AABC or NEBB as a TAB technician.

- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

1.8 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Volume, smoke, and fire dampers are open and functional.
 - d. Clean filters are installed.
 - e. Fans are operating, free of vibration, and rotating in correct direction.
 - f. Variable-frequency controllers' startup is complete and safeties are verified.
 - g. Automatic temperature-control systems are operational.
 - h. Ceilings are installed.
 - i. Windows and doors are installed.

- j. Suitable access to balancing devices and equipment is provided.

2. Hydronics:

- a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
- b. Piping is complete with terminals installed.
- c. Water treatment is complete.
- d. Systems are flushed, filled, and air purged.
- e. Strainers are pulled and cleaned.
- f. Control valves are functioning per the sequence of operation.
- g. Shutoff and balance valves have been verified to be 100 percent open.
- h. Pumps are started and proper rotation is verified.
- i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
- j. Variable-frequency controllers' startup is complete and safeties are verified.
- k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" ASHRAE 111 NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.

- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 - 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 4. Obtain approval from engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
1. Measure airflow of submain and branch ducts.
 2. Adjust submain and branch duct volume dampers for specified airflow.
 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure inlets and outlets airflow.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 2. Re-measure and confirm that total airflow is within design.
 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
 4. Mark all final settings.
 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 6. Measure and record all operating data.
 7. Record final fan-performance data.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
1. Check liquid level in expansion tank.
 2. Check highest vent for adequate pressure.
 3. Check flow-control valves for proper position.
 4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
 5. Verify that motor starters are equipped with properly sized thermal protection.
 6. Check that air has been purged from the system.

3.7 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Adjust pumps to deliver total design gpm.
 - 1. Measure total water flow.
 - a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 - 2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gage heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 - 3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
- B. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - 1. Measure flow in main and branch pipes.
 - 2. Adjust main and branch balance valves for design flow.
 - 3. Re-measure each main and branch after all have been adjusted.
- C. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - 1. Measure flow at terminals.
 - 2. Adjust each terminal to design flow.
 - 3. Re-measure each terminal after it is adjusted.
 - 4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - 5. Perform temperature tests after flows have been balanced.
- D. For systems with pressure-independent valves at terminals:
 - 1. Measure differential pressure and verify that it is within manufacturer's specified range.
 - 2. Perform temperature tests after flows have been verified.
- E. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - 1. Measure and balance coils by either coil pressure drop or temperature method.

2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

F. Verify final system conditions as follows:

1. Re-measure and confirm that total water flow is within design.
2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
3. Mark final settings.

G. Verify that memory stops have been set.

3.8 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.

B. Adjust the variable-flow hydronic system as follows:

1. Verify that the differential-pressure sensor is located as indicated.
2. Determine whether there is diversity in the system.

C. For systems with no diversity:

1. Adjust pumps to deliver total design gpm.

a. Measure total water flow.

- 1) Position valves for full flow through coils.
- 2) Measure flow by main flow meter, if installed.
- 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

b. Measure pump TDH as follows:

- 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
- 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
- 3) Convert pressure to head and correct for differences in gage heights.
- 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
- 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

2. Adjust flow-measuring devices installed in mains and branches to design water flows.

- a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
 3. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
 4. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
 5. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
 6. Prior to verifying final system conditions, determine the system differential-pressure set point.
 7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
 8. Mark final settings and verify that all memory stops have been set.
 9. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - c. Mark final settings.
 10. Verify that memory stops have been set.
- D. For systems with diversity:
1. Determine diversity factor.
 2. Simulate system diversity by closing required number of control valves, as approved by the design engineer.
 3. Adjust pumps to deliver total design gpm.
 - a. Measure total water flow.
 - 1) Position valves for full flow through coils.

- 2) Measure flow by main flow meter, if installed.
 - 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 - b. Measure pump TDH as follows:
 - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gage heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 - c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
4. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
5. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
6. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure, and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
7. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.

9. Prior to verifying final system conditions, determine system differential-pressure set point.
10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
11. Mark final settings and verify that memory stops have been set.
12. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - c. Mark final settings.
13. Verify that memory stops have been set.

3.9 PROCEDURES FOR PRIMARY-SECONDARY HYDRONIC SYSTEMS

- A. Balance the primary circuit flow first.
- B. Balance the secondary circuits after the primary circuits are complete.
- C. Adjust pumps to deliver total design gpm.
 1. Measure total water flow.
 - a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gage heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
- D. Adjust flow-measuring devices installed in mains and branches to design water flows.
 1. Measure flow in main and branch pipes.
 2. Adjust main and branch balance valves for design flow.

3. Re-measure each main and branch after all have been adjusted.
- E. Adjust flow-measuring devices installed at terminals for each space to design water flows.
1. Measure flow at terminals.
 2. Adjust each terminal to design flow.
 3. Re-measure each terminal after it is adjusted.
 4. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
 5. Perform temperature tests after flows have been balanced.
- F. For systems with pressure-independent valves at terminals:
1. Measure differential pressure and verify that it is within manufacturer's specified range.
 2. Perform temperature tests after flows have been verified.
- G. For systems without pressure-independent valves or flow-measuring devices at terminals:
1. Measure and balance coils by either coil pressure drop or temperature method.
 2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
- H. Verify final system conditions as follows:
1. Re-measure and confirm that total water flow is within design.
 2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 3. Mark final settings.
- I. Verify that memory stops have been set.

3.10 PROCEDURES FOR MOTORS

- A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer's name, model number, and serial number.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Phase and hertz.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter size and thermal-protection-element rating.
 8. Service factor and frame size.
- B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.11 PROCEDURES FOR CHILLERS

- A. Balance water flow through each evaporator and condenser to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller

installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:

1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
2. For water-cooled chillers, condenser-water entering and leaving temperatures, pressure drop, and water flow.
3. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
4. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
5. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
6. Capacity: Calculate in tons of cooling.
7. For air-cooled chillers, verify condenser-fan rotation and record fan and motor data including number of fans and entering- and leaving-air temperatures.

3.12 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record fan and motor operating data.

3.13 PROCEDURES FOR BOILERS

- A. Hydronic Boilers:
 1. Measure and record entering- and leaving-water temperatures.
 2. Measure and record water flow.
 3. Record relief valve pressure setting.

3.14 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each water coil:
 1. Entering- and leaving-water temperature.
 2. Water flow rate.
 3. Water pressure drop for major (more than 20 gpm) equipment coils, excluding unitary equipment such as reheat coils, unit heaters, and fan-coil units.
 4. Dry-bulb temperature of entering and leaving air.
 5. Wet-bulb temperature of entering and leaving air for cooling coils.
 6. Airflow.
- B. Measure, adjust, and record the following data for each electric heating coil:
 1. Nameplate data.
 2. Airflow.
 3. Entering- and leaving-air temperature at full load.
 4. Voltage and amperage input of each phase at full load.

5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.

3.15 CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Verify temperature control system is operating within the design limitations.
2. Confirm that the sequences of operation are in compliance with Contract Documents.
3. Verify that controllers are calibrated and function as intended.
4. Verify that controller set points are as indicated.
5. Verify the operation of lockout or interlock systems.
6. Verify the operation of valve and damper actuators.
7. Verify that controlled devices are properly installed and connected to correct controller.
8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.16 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the refrigerant charge.
4. Check the condition of filters.
5. Check the condition of coils.
6. Check the operation of the drain pan and condensate-drain trap.
7. Check bearings and other lubricated parts for proper lubrication.
8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
 - 1. New filters are installed.
 - 2. Coils are clean and fins combed.
 - 3. Drain pans are clean.
 - 4. Fans are clean.
 - 5. Bearings and other parts are properly lubricated.
 - 6. Deficiencies noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
 - 1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
 - 2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
 - 3. If calculations increase or decrease the airflow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
 - 4. Balance each air outlet.

3.17 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 - 2. Air Outlets and Inlets: Plus or minus 10 percent.
 - 3. Heating-Water Flow Rate: Plus or minus 10 percent.
 - 4. Cooling-Water Flow Rate: Plus or minus 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.18 PROGRESS REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.19 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
 - 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Pump curves.
 - 2. Fan curves.
 - 3. Manufacturers' test data.
 - 4. Field test reports prepared by system and equipment installers.
 - 5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 - 1. Title page.
 - 2. Name and address of the TAB specialist.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB supervisor who certifies the report.
 - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 - 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 - 12. Nomenclature sheets for each item of equipment.
 - 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 - 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 - 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.

- h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
 - 1. Quantities of outdoor, supply, return, and exhaust airflows.
 - 2. Water and steam flow rates.
 - 3. Duct, outlet, and inlet sizes.
 - 4. Pipe and valve sizes and locations.
 - 5. Terminal units.
 - 6. Balancing stations.
 - 7. Position of balancing devices.
- E. Fan Coil Units: include the following:
 - 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 - 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.
 - g. Cooling-coil static-pressure differential in inches wg.
 - h. Heating-coil static-pressure differential in inches wg.
 - i. Outdoor airflow in cfm.
 - j. Return airflow in cfm.
 - k. Outdoor-air damper position.

- l. Return-air damper position.
- m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

- a. System identification.
- b. Location.
- c. Coil type.
- d. Number of rows.
- e. Fin spacing in fins per inch o.c.
- f. Make and model number.
- g. Face area in sq. ft..
- h. Tube size in NPS.
- i. Tube and fin materials.
- j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

- a. Airflow rate in cfm.
- b. Average face velocity in fpm.
- c. Air pressure drop in inches wg.
- d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
- e. Return-air, wet- and dry-bulb temperatures in deg F.
- f. Entering-air, wet- and dry-bulb temperatures in deg F.
- g. Leaving-air, wet- and dry-bulb temperatures in deg F.
- h. Water flow rate in gpm.
- i. Water pressure differential in feet of head or psig.
- j. Entering-water temperature in deg F.
- k. Leaving-water temperature in deg F.
- l. Refrigerant expansion valve and refrigerant types.
- m. Refrigerant suction pressure in psig.
- n. Refrigerant suction temperature in deg F.
- o. Inlet steam pressure in psig.

G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

- a. System identification.
- b. Location.
- c. Make and type.
- d. Model number and unit size.
- e. Manufacturer's serial number.
- f. Fuel type in input data.
- g. Output capacity in Btu/h.
- h. Ignition type.
- i. Burner-control types.
- j. Motor horsepower and rpm.

- k. Motor volts, phase, and hertz.
 - l. Motor full-load amperage and service factor.
 - m. Sheave make, size in inches, and bore.
 - n. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - 2. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Entering-air temperature in deg F.
 - c. Leaving-air temperature in deg F.
 - d. Air temperature differential in deg F.
 - e. Entering-air static pressure in inches wg.
 - f. Leaving-air static pressure in inches wg.
 - g. Air static-pressure differential in inches wg.
 - h. Low-fire fuel input in Btu/h.
 - i. High-fire fuel input in Btu/h.
 - j. Manifold pressure in psig.
 - k. High-temperature-limit setting in deg F.
 - l. Operating set point in Btu/h.
 - m. Motor voltage at each connection.
 - n. Motor amperage for each phase.
 - o. Heating value of fuel in Btu/h.
- H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
 - 1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Coil identification.
 - d. Capacity in Btu/h.
 - e. Number of stages.
 - f. Connected volts, phase, and hertz.
 - g. Rated amperage.
 - h. Airflow rate in cfm.
 - i. Face area in sq. ft..
 - j. Minimum face velocity in fpm.
 - 2. Test Data (Indicated and Actual Values):
 - a. Heat output in Btu/h.
 - b. Airflow rate in cfm.
 - c. Air velocity in fpm.
 - d. Entering-air temperature in deg F.
 - e. Leaving-air temperature in deg F.
 - f. Voltage at each connection.
 - g. Amperage for each phase.
- I. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft..
 - g. Indicated airflow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual airflow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- K. Air-Terminal-Device Reports:
1. Unit Data:
 - a. System and air-handling unit identification.

- b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft..
 - 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary airflow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final airflow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.
- L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
 - 1. Unit Data:
 - a. System and air-handling-unit identification.
 - b. Location and zone.
 - c. Room or riser served.
 - d. Coil make and size.
 - e. Flowmeter type.
 - 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Entering-water temperature in deg F.
 - c. Leaving-water temperature in deg F.
 - d. Water pressure drop in feet of head or psig.
 - e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.
- M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
 - 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in gpm.
 - g. Water pressure differential in feet of head or psig.
 - h. Required net positive suction head in feet of head or psig.

- i. Pump rpm.
 - j. Impeller diameter in inches.
 - k. Motor make and frame size.
 - l. Motor horsepower and rpm.
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. Full-load amperage and service factor.
 - p. Seal type.
2. Test Data (Indicated and Actual Values):
 - a. Static head in feet of head or psig.
 - b. Pump shutoff pressure in feet of head or psig.
 - c. Actual impeller size in inches.
 - d. Full-open flow rate in gpm.
 - e. Full-open pressure in feet of head or psig.
 - f. Final discharge pressure in feet of head or psig.
 - g. Final suction pressure in feet of head or psig.
 - h. Final total pressure in feet of head or psig.
 - i. Final water flow rate in gpm.
 - j. Voltage at each connection.
 - k. Amperage for each phase.

N. Instrument Calibration Reports:

1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.20 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of commissioning authority.
- B. Commissioning authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

E. If TAB work fails, proceed as follows:

1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.

F. Prepare test and inspection reports.

3.21 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 23 07 13
HVAC DUCTWORK INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Ductwork insulation.
- B. Duct Liner.
- C. Insulation jackets.

1.02 RELATED SECTIONS

- A. Section 23 05 53 - Identification for HVAC Piping and Equipment.
- B. Section 23 31 13 - Ductwork.

1.03 REFERENCES

- A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. NAIMA National Insulation Standards.
- E. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- F. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.
- H. ASHRAE 90-75 – Insulation Standards

1.04 SUBMITTALS

- A. Division 1 - Submittals: Procedures for submittals.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Submit manufacturers' insulation instructions under provisions of Division 1.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience approved by manufacturer.

1.06 REGULATORY REQUIREMENTS

- A. Materials: Flame spread/fuel contributed/smoke developed rating of 25/50/50 in accordance with NFPA 255.
- B. Insulation thickness shall comply with all applicable energy conservation codes.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - INSULATION

- A. Owen Corning Fiberglass Corp.
- B. Manville Industrial Products
- C. Certain Teed Corporation
- D. 3M Corporation "Firemaster" for Kitchen Exhaust
- E. Substitutions: Under provisions of Division 1.

2.02 GLASS FIBER, RIGID

- A. Type A: Flexible glass fiber duct insulation; ANSI/ASTM C612; commercial grade; "K" value of 0.25 at 75° F; minimum density of 1-1/2 pounds per cu. ft.; factory applied vapor barrier jacket of 0.7 mil minimum aluminum foil laminated to glass fiber reinforced Kraft paper. Similar to Owens-Corning type FRK-25-ED 150 commercial grade.
- B. Type B: Rigid glass fiber board insulation with resin binder; ANSI/ASTM C612, Class 1; "K" value of 0.23 at 75° F minimum density of 6 pounds per cu. ft; factory applied white Kraft faced flame retardant vapor barrier jacket of aluminum laminated to heavy Kraft paper with a flame retardant snuffer type adhesive and reinforced with glass fibers; permeability of 0.2. Similar to Owens-Corning type 705 with AST jacket.
- C. Type C: Molded block or board insulation made of asbestos free hydrous calcium silicate; "K" value of 0.42 at 200° F; minimum density of 14 pounds per cubic foot; temperature range up to 1200° F.

- D. Type D: Flexible glass; ANSI/ASTM C553; "K" value of 0.23 15 75° F; minimum density of 1.5 pounds per cu. ft.; surface finish of black pigmented fire resistant resilient mastic coated on air side for maximum velocity of 4000 feet per minute.
- E. Type "E" – Fire resistant ductwrap consisting of light weight, non-asbestos high temperature non-organic ceramic fiber blanket encapsulated in foil/scrim having a service temperature rating of 2300° F. Wrap shall be applied in two temperature layers to provide a two-hour rated enclosure assembly. Bonding material shall be 304 stainless steel, 3/4" wide and .015" thick.
- F. Adhesives: Waterproof fire-retardant type. Smoke and flame spread rating less than 50.
- G. Indoor Jacket: Pre-sized glass cloth, minimum 7.8 oz/sq. yd unless otherwise specified above.
- H. Outdoor Jackets: Insulate as per the specification and jacket with Polyguard Insul-wrap 50W Membrane. For watertight insulation jacket install as per manufacturers recommendations. Furnish all mastics and adhesives as per manufacture system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Install insulation materials only after ductwork has been sealed, tested and approved.
- B. All insulated surfaces are to be cleaned and dried of any foreign material. This includes but is not limited to oil, water, dirt, rust and scale. Completely cover the entire surface to present a tight, smooth appearance.

3.02 INSTALLATION

- A. Division 1 - Quality Control: Install materials in accordance with manufacturer's instructions, specification requirements and in compliance with local code
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Apply insulation in such a way as to permit expansion and/or contraction of metal without causing damage to insulation, joints, seams or finish.
- D. Do not apply additional coats of mastic, adhesive, or sealers until previous coats have thoroughly dried.
- E. Fill in all surface imperfections such as chipped edges, small joints, cracks, holes and small voids with materials to match insulation. Make smooth with a skim coat of insulation cement. Extend surface finish to protect all surfaces and leave no exposed edges.
- F. Provide flashing for insulation installed outdoors to enclose all exposed edges or ends.
- G. Repair existing insulation where damaged by new work. Use materials to match existing.

- H. Cut, score or miter insulation to fit the slope and contour of surface to be covered. Insulation up to 3 inches thick to be applied in single layer. Over 3 inches apply in multiple layers, with joints staggered.

<u>Service</u>	<u>Type</u>	<u>Insulation Thickness</u>
² Interior H&V, AC systems RA & SA, ductwork that is exposed in equip rooms or any space	B	1-1/2"
Interior H&V, AC systems SA & RA Including flexible run outs & all concealed, not internally insulated ductwork.	A	1-1/2"
³ Outside air intake ductwork All	B	1 1/2"
¹ Exterior A.C. and H&V Supply and Return Ductwork Exposed on outdoors	B	2"
RA & SA ductwork 20' from any fan inlet or outlet, and 10' down stream of any VAV box	D	1"
Boiler and direct fired Absorber chiller Breeching	C	2"
1. Insulation Thickness shall be no less than the size indicated or the height of standing seams or angle bracing.		
2. reduce external insulation to 1" for internally lined ductwork except for outdoor installations. On outdoor installations insulation thickness shall be as scheduled but not less than the height of standing seams or angle bracing.		
3. Outside air intake and Kitchen exhaust ducts shall not be internally lined.		

END OF SECTION

SECTION 23 07 16
HVAC EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Equipment insulation
- B. Covering
- C. Breeching insulation

1.02 RELATED SECTIONS

- A. Section 23 05 53 – Identification for HVAC Piping and Equipment.
- B. Section 23 21 13 – Hydronic Piping.

1.03 REFERENCES

- A. ASHRAE 90-75 – Insulation Standards
- B. ASTM C195 – Standard Specification for Mineral Fiber Thermal Insulation Cement.
- C. ASTM C533 – Standard Specification for Calcium Silicate Block and Pipe Thermal
- D. ASTM C552 – Standard Specification for Cellular Glass Thermal Insulation.
- E. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- F. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- G. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- I. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- J. NAIMA National Insulation Standards.
- K. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS FOR REVIEW

- A. Division 1 – Submittal Requirements.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.
- C. Manufacturer's Instructions: Indicate installation procedures which ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Materials: Flame spread/fuel contributed/smoke developed rating of 25/50/50 in accordance with NFPA 255.
- B. Insulation thickness shall comply with applicable energy conservation codes.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Division 1 - Material and Equipment: Transport, handle, store, and protect products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Owens Corning Fiberglass Corp.
- B. Certain Teed Corporation
- C. Manville Industrial Products.
- D. Substitutions: Under provisions of Section 01630.

2.02 INSULATION

- A. Type A: Flexible glass fiber blanket; ANSI/ASTM C553; 'k' value of 0.23 at 75° F, 3.5 lb/cu feet density. Temperature range - 35° F to 250° F.
- B. Type B: Rigid glass fiber board; ANSI/ASTM C612; 'k' value of 0.24 at 75° F, 6.0 lb/cu feet. Temperature range - 35° F to 250° F.

- C. Type C: Molded cellular glass, chemically neutral 'K' value of 0.38 and 50° minimum density – 8.0 lb/w. ft. Temperature range - 35°F to 800°F.

2.03 ACCESSORIES

- A. Bedding Compounds: Non-shrinking, permanently flexible, compatible with insulation
- B. Vapor Barrier Coating: Non-flammable, fire resistant, polymeric resin, compatible with insulation.
- C. Insulating Cement: ANSI/ASTM C195, hydraulic setting mineral wool
- D. Wire Mesh: Corrosive-resistant metal; hexagonal pattern.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that equipment has been tested before applying insulation materials.
- B. Clean and dry all surfaces to be insulated of all foreign material. This includes but is not limited to water, oil, dirt, rust, and scale.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instruction, specification requirements and in compliance with local code.
- B. Only insulation and finish materials including adhesives, cements, and mastics which conform to the requirements of all governing codes & ordinances shall be used.
- C. Factory Insulated Equipment: Do not insulate.
- D. Exposed Equipment: Locate insulation and cover seams in least visible locations. Insulate expansion tanks, pumps, pot feeders etc.
- E. Apply insulation as close as possible to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands. Insulation shall be applied in single layers up to 3 inches thick; over 3 inches thick it shall be applied in multiple layers.
- F. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement. The surface finish shall be extended to protect all insulation surfaces. No raw edges or ends shall be left exposed.
- G. Insulated equipment containing fluids below ambient temperature: Insulate entire system.
- H. Cover insulation with metal mesh and finish with heavy coat of insulating cement.

- I. Insulation shall be applied in such a way as to permit expansion or contraction of metal without causing damage to insulation or surface finish. Seal or cement shall not be applied until all previous application of cements and adhesives have thoroughly dried.
- J. Vapor barrier finishes shall not be stapled through.
- K. Clean and dry all surfaces to be insulated of rust, scale, dirt, oil, water and other foreign matter. Apply insulation to completely cover metal surface. Surface finish shall be applied to present a tight, smooth appearance.
- L. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
- M. Equipment Requiring Access for Maintenance, Repair, Cleaning: Install insulation so it can be easily removed and replaced without damage.
- N. Insulate all pumps with type C insulation. Fabricate custom aluminum sheet metal enclosure around pump body and fittings. Cut and fit insulation to tightly fit the size and shape of the pump body parts including the volute and inlet and outlet piping and fittings. The enclosure shall be removable without cutting or breaking the insulation. The enclosure shall be vapor tight to prevent condensation.

3.03 SCHEDULES

<u>EQUIPMENT</u>	<u>INSULATION TYPE</u>	<u>THICKNESS</u>
Air Handler Components and Fans, Not Factory insulated including coil & filter sections	B	1.5"
Return fans	B	1.5"
Expansion Tanks/Chemical Feed Tanks and heat exchangers All Specialties valves, air separators	C	1.5"
Boilers Factory Installed Jackets	Factory Installed Jackets Min 2"	
Pumps	C	2"
END OF SECTION		

SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation
- B. Jackets and accessories

1.02 RELATED SECTIONS

- A. Section 23 05 53 – Identification for HVAC Piping and Equipment.
- B. Section 23 21 13 – Hydronic Piping.

1.03 REFERENCES

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- C. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
- D. ASTM C518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- E. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
- F. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation
- G. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
- H. ASTM C578 - Standard Specification for Preformed, Cellular Polystyrene Thermal Insulation
- I. ASTM C610 - Standard Specification for Expanded Perlite Block and Pipe Thermal Insulation
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- K. NAIMA National Insulation Standards
- L. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials

M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

N. ASHRAE 90-75 - Insulation Standards

1.04 SUBMITTALS FOR REVIEW

A. Division 1 – Submittal Requirements.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with NFPA 255

B. Insulation thickness shall comply with applicable Energy Conservation Codes.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Pittsburgh Corning Corporation

B. Certainteed Corporation.

C. Armstrong Corporation.

D. Manville Industrial Products.

E. Owens-Corning Fiberglass Corporation

F. Polyguard

2.02 INSULATION

A. Type A: Molded glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.23 at 75° F; noncombustible. Minimum density of 3.5 lbs./cu. Ft.; temperature range 35° F to 450° F.

B. Type B: Cellular glass insulation; ASTM C552; 'K' Value of 0.53 at 75°F; non-combustible. Minimum density of 8.0 lbs./cu. ft. similar to Pittsburgh Corning Foamglas.

- C. Type C: Elastomeric insulation; ASTM C518, C177; 'K' Value of 0.27 at 75°F; non-combustible. Similar to Armstrong "AP Armaflex"; temperature range -40° F to 220° F
- D. Type D; Underground engineered pipe insulation system shall be as follows;
Service pipe insulation shall be spray applied .16k-factor, R141B blowing agent, nominal 2 pound per cubic foot density, polyurethane foam for straight sections and preformed polyurethane foam for all fittings. Insulation shall not be less than 2" and shall be Perma-pipe polytherm

2.03 JACKETS

A. Interior Applications:

- 1. Insulation Type A - Factory applied, white, flame retardant, all service (ASJ) vapor barrier jacket of .001" aluminum foil laminated to Kraft paper with a flame retardant snuffer type adhesive reinforced with glass fibers and having a self sealing lap. Provide 2" longitudinal lap and 4" circumferential sealing strips. Permeability .02 perm.

B. Exterior Applications:

- 1. Insulation Type A thickness as scheduled with ASJ vapor barrier jacket - Cover factory interior jacket with Alumaguard 60 .06" foil faced rubberized bitumen membrane designed specifically to be installed over insulation on exterior piping, tanks, vessels, and equipment. The membrane shall be 'peel and stick', self-healing if punctured, UV stable, and will expand and contract with the mechanical system. All seams shall be sealed water tight. Permeability .0053 perm

C. Piping exposed in Mechanical Rooms or any space:

- 1. All exposed piping and fittings shall be completely covered with white Zeston 2000 PVC insulated piping and fitting covers. Apply as per manufacturer with perma weld adhesive.

D. Underground applications:

All straight sections of the insulated piping system shall be filament wound, polyester resin/fiberglass reinforcement composite directly applied on the insulating foam. The jacket shall be either filament wind fiberglass directly onto the polyurethane foam or injected foam into a fiberglass outer casing.

Fiberglass outer casing shall be A.O. Smith Red Thread or Ameron Bondstrand 3000. Thermoplastic casing material that are not rated for temperatures above 140 degrees F will not be allowed, e.g., PVC or HDPE. The minimum thickness for FRP jacket shall be as 0.55"

2.04 ACCESSORIES

- A. Insulation Bands: ¾" wide; 0.007 inch thick aluminum.
- B. Metal Jacket Bands: 3/8" wide; 0.015 inch thick aluminum.

- C. Insulating Cement: ANSI/ASTM C195; hydraulic setting mineral wool.
- D. Finishing Cement: ASTM C449
- E. Fibrous Glass Cloth: Untreated; 9 oz/sq. yd weight.
- F. Adhesives: Compatible with insulation and fire retardant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with all foreign material removed. This includes but is not limited to water, oil, dirt, scale and rust.
- D. Only insulation and finish materials including adhesive cements and mastic which conform to the requirements of all-governing codes and ordinances shall be used.

3.02 INSTALLATION

- A. Division 1 – Quality Control: Install materials in accordance with manufacturer's instructions and the best practice of the trade.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulation on all piping shall be vapor sealed. On insulated piping with vapor barrier, insulate all fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints. Vapor seal all exposed edges with jacket material and vapor barrier type adhesive.
- D. Repair or replace any existing insulation and surface finish disturbed or damaged by installation of new work using materials to match existing.
- E. Apply insulation to completely cover metal surface. Surface shall be applied to present a tight, smooth appearance.
- F. Exposed Piping: Locate insulation and cover seams in least visible locations.
- G. For hot piping conveying fluids 140 degrees F or less, and on insulated piping without vapor barrier, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- H. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- I. Neatly finish insulation at supports, protrusions, and interruptions.
- J. Do not use staples on vapor barrier insulation.

K. Jackets:

1. Indoor, Concealed Applications: Insulated pipes conveying fluids above ambient temperature shall have standard jackets, with vapor barrier, factory-applied or field-applied. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass cloth and adhesive. PVC jackets may be used
2. Indoor, Concealed Applications: Insulated dual-temperature pipes or pipes conveying fluids below ambient temperature shall have vapor barrier jackets, factory-applied. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe, and finish with glass cloth and vapor barrier adhesive.
3. Indoor, Exposed Applications: For pipe exposed in mechanical equipment rooms or in finished spaces, insulate and jacket as for concealed applications, and finish with PVC jackets.
4. Outdoor Applications: Cover with .016" aluminum jacket with 2" overlap at seams and joints. Lay joints downward to shed water. Secure with 3/8" seals and straps at joints and aluminum bands on 8" centers between joints.

L. Inserts and Shields:

1. Application: All insulated Piping 2 inches diameter or larger shall be installed with inserts and shields as follows.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert location: Between support shield and piping and under the finish jacket.
4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

M. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

N Underground applications:

The internal pipe shall be hydrostatically tested to 150 psig or 1½ times the operating pressure, whichever is greater. Insulation shall then be poured in place into the field weld area. All field applied insulation shall be placed only in straight sections. Field insulation of fittings shall not be acceptable. The mold for the polyurethane shall be made of clear adhesive backed polyester film. The installer shall seal the field joint area with a heat shrinkable adhesive backed wrap or with wrappings of glass reinforcement fully saturated with a catalyzed resin identical in properties to the factory-applied resin. Backfilling shall not begin until the heat shrink wrap has cooled or until the FRP lay-up has cured. All insulation and coating materials for making the field joint shall be furnished by the piping system manufacture

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular

- surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

3.05 SCHEDULE

Piping	Type	Pipe Size (in)	Insulation Thickness (in)
Heating Hot Water	A	$\leq 1 \frac{1}{2}$ $> 1 \frac{1}{2}$	1 2
Buried HW&CW	C	All	2 1/2
Buried Cond water	C	All	1"
Steam/Condensate	A	$\leq 1 \frac{1}{2}$ $> 1 \frac{1}{2}$	1 1/2 3
Chilled water	A	$\leq 1 \frac{1}{2}$ $> 1 \frac{1}{2}$	1 1 1/2
Condensate Drains	A	All	1
Make-up Water	A	$\leq 1 \frac{1}{2}$ $> 1 \frac{1}{2}$	1 1 1/2
Domestic Hot Water	A	$\leq 1 \frac{1}{2}$ $> 1 \frac{1}{2}$	1 2
Refrigerant Hot Gas. (All)	C	ALL	1
Humidifier steam	A	ALL	1
Refrigerant Suction	C	ALL	1 1/2
Storm Piping (Inside building)	A	$\leq 1 \frac{1}{2}$ $> 1 \frac{1}{2}$	1 1 1/2
Domestic Cold Water	A	$\leq 1 \frac{1}{2}$ $> 1 \frac{1}{2}$	1 1 1/2

END OF SECTION

SECTION 23 09 00
INSTRUMENTATION AND CONTROL ELEMENTS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Control Panels
- B. Control Valves
- C. Dampers
- D. Damper Operators
- E. Input Output sensors
- F. Thermostats
- G. Time Clocks
- H. Transmitters
- I. Flow Switches
- J. Relays
- K. Transformers and Power Supplies
- L. Smoke Detectors
- M. Transducers
- N. Solenoid Valves
- O. Current Switches

1.02 RELATED SECTIONS

- A. Section 23 09 23 - Direct Digital Controls Equipment.
- B. Section 23 09 93 - Sequence of Operation.

1.03 REFERENCES

- A. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- C. ASTM B32 - Solder Metal.
- D. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- E. ASTM D1693 - Environmental Stress - Cracking of Ethylene Plastics.

- F. NEMA DC 3 - Low-Voltage Room Thermostats.
- G. NFPA 70 - National Electrical Code.
- H. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

1.04 SUBMITTALS FOR REVIEW

- A. Division 1 - Submittals: Procedures for submittals.
- B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
- C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.
- D. Samples: Submit one of each type of room thermostat and cover each control component exposed in finished areas.
- E. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
 - 2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
 - 3. Wiring Diagrams: Power, signal, and control wiring.
 - 4. Details of control panel faces, including controls, instruments, and labeling.
 - 5. Schedule of dampers including size, leakage, and flow characteristics.
 - 6. Schedule of valves including flow characteristics.
 - a. Wiring diagrams for control units with termination numbers.
 - b. Schematic diagrams and floor plans for field sensors and control hardware.
 - c. Schematic diagrams for control, communication, and power wiring.

1.05 SUBMITTALS FOR INFORMATION

- A. Division 1 - Submittals: Procedures for submittals.
- B. Manufacturer's Instructions: Provide for all manufactured components.

1.06 SUBMITTALS AT PROJECT CLOSEOUT

- A. Division 1 - Project Closeout, Operation and Maintenance Data.

- B. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
- C. Revise shop drawings to reflect actual installation and operating sequences.
- D. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, calibration tolerances, and setpoints.
- E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owners name and registered with manufacturer.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.
- C. Design system under direct supervision of a Professional Engineer experienced in design of this Work and licensed in the State of New Jersey.

1.08 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., or a testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 PRE-INSTALLATION MEETING

- A. Section 01040 - Coordination and Meetings: Pre-installation Meeting as directed.

1.10 WARRANTY

- A. Division 1 - Contract Closeout.
- B. Correct defective Work within a one year period after Substantial Completion.

1.11 MAINTENANCE SERVICE

- A. Division 1 - Contract Closeout.
- B. Provide service and maintenance of control system for one year from Date of Substantial Completion.
- C. Provide complete service of controls systems, including call backs. Make minimum of two complete normal inspections of approximately 8 hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

1.12 EXTRA MATERIALS

- A. Division 1 – Project Closeout, Operation and Maintenance Data.
- B. Provide two of each type of thermostat exposed sensor.

1.13 SYSTEM PERFORMANCE

- B. Comply with the following performance requirements
 - 1. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:
 - a. Water Temperature: Plus or minus 1 deg F
 - b. Space Temperature: Plus or minus 1 deg F.
 - c. Ducted Air Temperature: Plus or minus 1 deg F
 - d. Outside Air Temperature: Plus or minus
 - e. Temperature Differential: Plus or minus 25 deg F
 - f. Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
 - g. Air Pressure (Ducts): Plus or minus 0.1-inch wg

1.14 DELIVERY, STORAGE, AND HANDLING

- C. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Other Acceptable Manufacturers:
 - 1. Andover Controls – As per the College standard
- B. Division 1 – Product Options and Substitutions: Substitutions: In accordance with the Contract.

2.02 CONTROL PANELS

- A. All indoor control cabinets shall be fully enclosed NEMA 1 Type construction with hinged door, key-lock latch, removable sub-panels. A single key shall be common to all field panels and sub-panels.
- B. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control termination's for field connection shall be individually identified per control drawings.

- C. Provide on/off power switch with over-current protection and main air gauge for control power sources to each local panel.

2.03 CONTROL VALVES

A. Globe Pattern:

1. Up to 2 inches: Bronze body, bronze trim, ANSI Class 250, rising stem, renewable composition disc, spring loaded, screwed ends with backseating capacity repackable under pressure.
2. Over 2 inches: Iron body, ANSI Class 125, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc Teflon packing .
3. Hydronic Systems:
 - a. Rate for service pressure of 250 psig at 250 degrees F.
 - b. Replaceable plugs and seats of stainless steel brass.
 - c. Size for 3 psig maximum pressure drop at design flow rate.
 - d. Two-way valves shall have equal percentage characteristics, Close-off (differential) Pressure Rating shall be 150% of total system pump head.

B. Electronic Operators:

1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.
2. Select operator for full shut off at maximum pump differential pressure. Heating valves shall be normally open upon power loss.
3. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
4. All rotary spring return actuators shall be capable of both clockwise or counter clockwise spring return operation. Linear actuators shall spring return to the retracted position.
5. Proportional actuators shall accept a 0-10 VDC or 0-20 ma control signal and provide a 2-10 VDC or 4-20 ma operating range.

C. Radiation Valves:

1. Bronze body, bronze trim, 2 or 3 port as indicated, replaceable plugs and seats, union and threaded ends.
2. Rate for service pressure of 125 psig at 250 degrees F
3. Size for 3 psig kPa maximum pressure drop at design flow rate.
4. Two-way valves shall have equal percentage characteristics, three way valves linear characteristics. Size two way valve operators to close valves against pump shut off head.
5. Operators (2 Position): Synchronous motor with enclosed gear train, dual return springs, valve position indicator; 24 v DC, 0.4 amp. Valves shall spring return to normal position for temperature protection.
6. Operators (Modulating): Self contained, linear motorized actuator with approximately 3/4 inch (19 mm) stroke, 60 second full travel with transformer and SPDT contacts: 24 v DC, 6 watt maximum input.

2.04 DAMPERS

- A. Tamco Series 9000
- B. Other Acceptable Manufacturers:
 - 1. Ruskin.
 - 2. Nailer Hart.
 - 3. Arrow Louver & Damper Co
- C. Performance: Test in accordance with AMCA 500.
- D. Frames: Galvanized steel or Extruded aluminum, Stainless steel, welded or riveted with corner reinforcement, minimum 12 gage.
- E. Blades: Galvanized steel or Extruded aluminum, Stainless steel, maximum blade size 8 inches 6 inches wide, 48 inches long, minimum 22 gage, attached to minimum 1/2 inch shafts with set screws. Opposed Blade design
- F. Blade Seals: Synthetic elastomeric or Neoprene mechanically attached, field replaceable.
- G. Jamb Seals: Spring stainless steel.
- H. Shaft Bearings: Oil impregnated sintered bronze or Lubricant free, stainless steel, single row, ground, flanged, radial, antifriction type with extended inner race.
- I. Linkage Bearings: Oil impregnated sintered bronze.
- J. Leakage: Less than 1/2 percent based on approach velocity of 2000 ft/min and 4 inches wg.
- K. Maximum Pressure Differential: 6 inches wg.
- L. Temperature Limits: -40 to 200 degrees F.

2.05 DAMPER OPERATORS

- A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
- B. Electric Operators:
 - 1. Manufacturer: Belimo.
 - 2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.

3. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch minimum position potentiometer and 24 V dc, 24 va transformer as required.
- C. Number: Sufficient to achieve unrestricted movement throughout damper range. Provide one damper operator for maximum 36 sq ft damper section.
- D. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
- E. All rotary spring return actuators shall be capable of both clockwise or counter clockwise spring return operation. Linear actuators shall spring return to the retracted position.

2.06 INPUT/OUTPUT SENSORS

A. Temperature:

1. Manufacturer: Andover
2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.
 - c. Division 1 - Product options and substitutions. Substitutions: As per the Contract.
3. Resistance temperature detectors with resistance tolerance of plus or minus 0.1 percent at 70 degrees F, interchangeability less than plus or minus 0.2 percent, time constant of 13 seconds maximum for fluids and 200 seconds maximum for air.
4. Measuring current maximum 5 mA with maximum self-heat of 0.031 degrees F/mW in fluids and 0.014 degrees F/mW in air.
5. Provide 3 lead wires and shield for input bridge circuit.
6. Use insertion elements in ducts not affected by temperature stratification or smaller than one square meter. Use averaging elements on all safety controls and where larger or prone to stratification sensor length 8 feet or 16 feet as required.
7. Insertion elements for liquids shall be with brass socket with minimum insertion length of 2-1/2 inches.
8. Room sensors: equipped with set point, and fan speed adjustment as indicated on drawings and schedules for each piece of equipment, and Locking cover.
9. Outside air sensors: Watertight inlet fitting, shielded from direct rays of sun.
10. Room security sensors: Stainless steel cover plate with insulated back and security screws.

B. Static Pressure Sensors:

1. Manufacturer: Andover.
2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.
 - c. Division 1 - Product options and substitutions. Substitutions: As per the Contract.

3. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
4. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
5. Accuracy: One percent of full scale with repeatability 0.3 percent.
6. Output: 0 - 5 vdc with power at 12 to 28 vdc.

C. Equipment Operation Sensors:

1. Manufacturer: Andover.
2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.
 - c. Division 1 - Product options and substitutions. Substitutions: As per the Contract.
3. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5 inches wg (0 to 1250 Pa).
4. Status Inputs for Pumps: Differential pressure switch piped across pump with adjustable pressure differential range of 8 to 60 psi, with stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (DP) and maximum static pressure shall be 3,000 psi. Transmitter shall be complete with 4-20 ma output, required mounting brackets, and five-valve manifold. Mount in a location accessible for service.
5. Status Inputs for Electric Motors: Current sensing relay with current transformers, adjustable and set to 175 percent of rated motor current. Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.
6. Valve and Damper Position Indication: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 – 100 percent damper travel.
7. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.
8. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.
9. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.
10. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

11. Water-Flow Switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless-steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

2.07 THERMOSTATS

- A. Low Voltage On-Off Room Thermostats: (Not Applicable) refer to 230923 direct digital controls

1. Manufacturer: Andover.
2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.
 - c. Division 1-Product options and substitutions. Substitutions: Permitted. Not permitted.
3. Type: NEMA DC 3, 24 volts, with setback/setup temperature control. NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, 55 to 85 deg F set-point range, and 2 deg F maximum differential.
4. Service: cooling only heating only cooling and heating one step cooling and one step heating.
5. Covers: Locking with concealed set point adjustment, set-point indication ,and thermometer.
6. Combination Thermostat and Fan Switches:
 - a. Label lever-operated switches "FAN ON-OFF-Auto"
 - b. Mount on single electric switch box

- C. Line Voltage ON-Off Room Thermostats: (Not Applicable) refer to 230923 direct digital controls

1. Manufacturer: Andover.
2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.
 - c. Division 1 - Product options and substitutions. Substitutions: As per the Contract.
3. Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.
4. Cover: Locking with concealed setpoint, and with thermometer.
5. Rating: Motor load.
6. Combination Thermostat and Fan Switches:
 - A. Label lever-operated switches "FAN ON-OFF-Auto"
 - B. Mount on single electric switch box

D. Room Thermostat Accessories:(Not Applicable) refer to 230923 direct digital controls

1. Thermostat Covers: Brushed aluminum.
2. Insulating Bases: For thermostats located on exterior walls.
3. Adjusting Key: As required for device.

E. Outdoor Reset Thermostat:

1. Manufacturer: Andover
2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.
 - c. Division 1 - Product options and substitutions. Substitutions: As per the Contract.
3. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.
4. Scale range: -10 to 70 degrees F (2 to 35 degrees C).

F. Immersion Thermostat:

1. Manufacturer: Andover.
2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.
 - c. Division 1-Product options and substitutions. Substitutions: As per the Contract.
3. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint and adjustable throttling range.

G. Airstream Thermostats:

1. Manufacturer: Andover.
2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.
 - c. Division 1-Product options and substitutions. Substitutions: As per the Contract.
3. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
4. Averaging service remote bulb element: 7.5 feet 20 feet.

H. Electric Low Limit Duct Thermostat:

1. Manufacturer: Andover.
2. Other acceptable manufacturers offering equivalent products.

- a. Johnson.
 - b. Honeywell.
 - c. Division 1-Product options and substitutions. Substitutions: As per the Contract.
 3. Snap acting, single pole, single throw, manual reset switch which trips if temperature sensed across any 12 inches of bulb length is equal to or below setpoint,
 4. Bulb length: Minimum 20 feet.
 5. Provide one thermostat for every 20 sq ft of coil surface.
- I. Electric High Limit Duct Thermostat:
1. Manufacturer: Andover.
 2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.
 - c. Division 1-Product options and substitutions. Substitutions: As per the Contract.
 3. Snap acting, single pole, single throw, manual reset switch which trips if temperature sensed across any 12 inches of bulb length is equal to or above set-point,(120 deg F adjustable)
 4. Bulb length: Minimum 20 feet.
 5. Provide one thermostat for every 20 sq ft of coil surface.
- J. Electric, solid-state, microcomputer-based room thermostat with remote sensor.
- To be used with ductless split system AC unit and shall be the same manufacture as the AC unit systems.
1. Automatic switching from heating to cooling.
 2. Preferential rate control to minimize overshoot and deviation from set point.
 3. Set up for four separate temperatures per day.
 4. Instant override of set point for continuous or timed period from 1 hour to 31 days.
 5. Short-cycle protection.
 6. Programming based on every day of week.
 7. Selection features include degree F or degree C display, 12- or 24-hour clock, keyboard disable, remote sensor, and fan on-auto.
 8. Battery replacement without program loss.
 9. Thermostat display features include the following:
 - a. Time of day.
 - b. Actual room temperature.
 - c. Programmed temperature.
 - d. Programmed time.
 - e. Duration of timed override.
 - f. Day of week.

- g. System mode indications include "cooling" "heating," "off," "fan auto," and "fan on."

2.08 TIME CLOCKS (Not used)

- A. Andover.
- B. Other Acceptable Manufacturers:
 - 1. Johnson.
 - 2. Honeywell.
 - 3. Division 1 - Product options and substitutions. Substitutions: As per the Contract.
- C. Seven day programming switch timer with synchronous timing motor and seven day dial, continuously charged Ni-cad battery driven power failure 8 hour carry over and multiple switch trippers to control systems for minimum of two and maximum of eight signals per day with two normally open and two normally closed output switches.
- D. Solid state programmable time control with separate programs, 24 hour battery carry over 7 day programming 365 day calendar with 20 programmable holidays choice of fail safe operation for each program.

2.09 TRANSMITTERS

- A. Static Pressure Transmitter:
 - 1. Manufacturer: Andover.
 - 2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.
 - c. Division 1-Product options and substitutions. Substitutions: As per the Contract.
 - 3. One pipe, differential type with temperature compensation, scale range 0.01 to 6.0 inch wg positive or negative, and sensitivity of 0.0005 inch wg. Transmit electronic signal to receiver with matching scale range.
 - 4. Output: 4 to 20 Ma.
 - 5. Building Static-Pressure Range: 0- to 0.25-inch wg.
 - 6. Duct Static-Pressure Range: 0- to 5-inch wg
- B. Pressure Transmitters:
 - 1. Manufacturer: Andover.
 - 2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.
 - c. Division 1-Product options and substitutions. Substitutions: As per the Contract.

3. One pipe direct acting indicating type for gas, liquid, or steam service, range suitable for system, linear 4-20 MA output.
- C. Temperature Transmitters:
1. Manufacturer: Andover.
 2. Other acceptable manufacturers offering equivalent products.
 - a. Johnson.
 - b. Honeywell.
 - c. Division 1- Product options and substitutions. Substitutions: As per the Contract.
 3. One pipe, directly proportional output signal to measured variable, linearity within plus or minus 1/2 percent of range for 200 degree F span and plus or minus 1 percent for 50 degree F span, with 100 degrees F temperature range, compensated bulb, averaging capillary.
- D. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure; linear output 4 to 20 mA.
- E. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure and tested to 300-psig; linear output 4 to 20 mA.
- F. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.

2.10 FLOW SWITCHES

- A. Flow-proving switches shall be either paddle or differential pressure type, as shown.
- B. Paddle type switches (water service only) shall be UL listed, SPDT snap-acting with pilot duty rating (125 VA minimum). Adjustable sensitivity with NEMA 1 Type enclosure unless otherwise specified:
- C. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 Type enclosure, with scale range and differential suitable for intended application, or as specified.

2.11 RELAYS:

- A. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.
- B. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 Type enclosure when not installed in local control panel.

2.12 TRANSFORMERS and POWER SUPPLIES

- A. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.
- B. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in 150 %over-voltage protection.
- C. Unit shall operate between 0 C and 50 C.
- D. Unit shall be UL recognized.

2.13 SMOKE DETECTORS

- A. Air duct smoke detectors shall be by Air Products & Controls or approved equal. The detectors shall operate at air velocities from 300 feet per minute to 4000 feet per minute.
- B. The smoke detector shall utilize a photoelectric detector head.
- C. The housing shall permit mechanical installation without removal of the detector cover.
- D. The detectors shall be listed by Underwrites Laboratories and meet the requirements of UL 268A.

2.14 ELECTRIC/PNEUMATIC TRANSDUCERS

- A. Electric to pneumatic transducers shall operate from either a PWM or analog signal. E/P transducers shall be rated for 0 – 20 psi operation and accurate to 2% of full scale. E/P transducers shall have a maximum air consumption of 100 SCIM.
- B. E/P transducers may be installed at the end device (damper or valve), or mounted separately in a field interface panel, or as part of the controller. All transducers will be calibrated. Panel mounted transducers shall be Sensycon, or approved equal.

2.15 ELECTRIC/PNEUMATIC SOLENOID VALVES

- A. Electric solenoid operated pneumatic valves (EP's) shall have a three port operation: common, normally open and normally closed. They shall be rated for 50 psig when used for 25 psig or less applications, or rated for 150 psig when used for 100 psig or less applications. The coils shall be equipped with transient suppression devices to limit transients to 150 percent of the rated coil voltage.

2.16 CURRENT SWITCHES

- A. Current-operated switches shall be self-powered, solid state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system

PART 3 EXECUTION

3.01 EXAMINATION

- A. Division 1 – Project Coordination: Verification of existing conditions before starting work.
- B. Verify that systems are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.
- D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- F. Ensure installation components is complementary to installation of similar components.
- G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats humidistats and other exposed control sensors with plans and room details before installation. Locate 60 inches 48 inches 42 inches above floor. Align with lighting switches and humidistats.
- C. Mount freeze protection thermostats using flanges and element holders.
- D. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.
- E. Provide separable sockets for liquids and flanges for air bulb elements.
- F. Provide clear plastic guards on thermostats in entrances and other public areas and where indicated.
- G. Provide valves with position indicators and with pilot positioners where sequenced with other controls.
- H. Provide separate steam control valves for each bank of coils. Provide two valves in parallel where steam load exceeds 1500 lb/hr with 1/3 - 2/3 load capacities sequenced with smaller valve opening first. (Not applicable)
- I. Provide mixing dampers of opposed construction arranged to mix streams. Provide pilot positioners on mixed air damper motors. Provide separate minimum outside air damper section adjacent to return air dampers with separate damper motor.
- J. Provide isolation (two position) dampers of parallel blade construction.

- K. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.
- L. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.
- M. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.
- N. Provide conduit and electrical wiring in accordance with specifications. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION

SECTION 232113
HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe and pipe fittings for:
 - 1. Heating water piping system.
 - 2. Dual temperature
 - 3. Chilled water
 - 4. Condenser water
 - 5. Make up water
 - 6. Condensate drains
- B. Valves:
 - 1. Gate valves.
 - 2. Globe or angle valves.
 - 3. Ball valves.
 - 4. Plug valves.
 - 5. Butterfly valves.
 - 6. Check valves.
 - 7. Relief valves.
 - 8. Balancing valves.
 - 9. Automatic flow control valves

1.02 RELATED SECTIONS

- A. Section 23 05 16 - Expansion Fittings and Loops for HVAC Piping.
- B. Section 23 05 48 - Vibration Controls for HVAC Equipment and Piping.
- C. Section 23 05 53 - Identification for HVAC Piping and Equipment.
- D. Section 23 07 19 - HVAC Piping Insulation.
- E. Section 23 21 14 - Hydronic Specialties.

1.03 REFERENCES

- A. ASME - Boiler and Pressure Vessel Codes, SEC 9 - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators
- B. ASME B16.3 - Malleable Iron Threaded Fittings Class 50 and 300.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

- F. ASME B31.9 - Building Services Piping
- G. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
- H. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- I. ASTM B32 - Solder Metal
- J. ASTM B88 - Seamless Copper Water Tube
- K. AWS A5.8 - Brazing Filler Metal
- L. AWS D1.1 - Structural Welding Code.
- M. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
- N. AWWA C110 - Ductile - Iron and Grey -Iron Fittings 3 in. through 48 in., for Water and Other Liquids
- O. AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.
- P. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- Q. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacture.
- R. MSS SP69 - Pipe Hangers and Supports - Selection and Application
- S. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices

1.04 SUBMITTALS

- A. Submit under provision of Division 1.
- B. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of contract.
- B. Record actual locations of valves

1.06 REGULATORY REQUIREMENTS

- A. Conform to ASME B31.9 code for installation of piping system.

- B. Welding Materials and Procedures: Conform to ASME SEC 9 and applicable state labor regulations.
- C. Welders Certification: In accordance with National certified Pipe Welding Bureau of the Mechanical Contractors association.
- D. Valves: Manufacturer's name and pressure rating marked on valve body.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of the Contract.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL

- A. All pipe shall be new, clean, of domestic manufacture and marked with appropriate standard.
- B. Fittings shall be factory manufactured. Shop or field fabricated fittings are not acceptable. Welding fitting shall be "Sypris Tube-Turns" or equivalent. Fittings shall have the same pressure rating as the system in which they are installed.
- C. All valves shall have the same pressure rating as the system in which they are installed and shall be capable of being repacked while wide open and operating at their rated pressure.

2.02 HOT WATER, CHILLED WATER, DUAL TEMP (ABOVE GROUND)

- A. Steel Pipe: ASTM A53, Schedule 40, black
 - 1. Fittings: ASTM B16.3, malleable iron or ASTM A234, forged steel welding type fittings.
 - 2. Joints: Threaded, for pipe sized 2" or smaller and a WSD1.1 welded on sizes 2 1/2" and larger.
- B. Grooved Mechanical-Joint Fittings and Couplings: (sizes 2-1/2" and larger)

1. Provide a comparable product by one of the following:
 - a. National Fittings, Inc.
 - b. S. P. Fittings; a division of Star Pipe Products.
 - c. Victaulic Company of America.
 2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 3. Couplings: Ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
- C. Copper Tubing: ASTM B88, Type L, hard drawn.
1. Fittings: ASME B16.18, cast brass.
 2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 - 1480 degrees F.
- 2.03 HEATING WATER PIPING, CHILLED WATER, DUAL TEMP (BURIED) (**NOT USED**)
- A. Steel Pipe: ASTM A53, Schedule 40, wall for sizes for up to 10 inch. with AWWA C105. Piping shall be an engineered pre-insulated system by Perma-Pipe polytherm system
1. Fittings: ASTM A234, forged steel welding type. 2. Joints: AWS D1.1, welded.
 2. The piping shall be an engineered system designed by the manufacture. The contractor shall submit to the engineer for review and approval a shop drawing from the pipe manufacture which has been field verified. The manufactures shall identify and include in the submittal all specialties including termination fittings, wall penetration details, expansion joints and loops.
- 2.04 CONDENSER WATER PIPING (**NOT USED**)
- A. Steel Pipe: ASTM A53, Schedule 80, for all sizes
1. Fittings: ASTM B16.3, malleable iron or ASTM A234, forged steel welding type. 150 lb class
 2. Joints: Threaded, for pipe sized 2" or less. and AWS D1.1 welded on sized larger then 2".
- B. Copper Tubing: ASTM B88, Type L, hard drawn.
1. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
 2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
 3. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 - 1480 degrees F.
- C. CONDENSER WATER PIPING (BURIED)

1. Steel Pipe: ASTM A53, Schedule 80, wall for sizes for up to 20 inch. with AWWA C105. Piping shall be an engineered pre-insulated system by Perma-Pipe polytherm system
 - a. Fittings: ASTM A234, forged steel welding type. With double layer, half-lapped 10 mil polyethylene tape. Joints: AWS D1.1, welded.
 - b. The piping shall be an engineered system designed by the manufacture. The contractor shall submit to the engineer for review and approval a shop drawing from the pipe manufacture which has been field verified. The manufactures shall identify and include in the submittal all specialties including termination fittings, wall penetration details, expansion joints and loops.
- 2.05 Fittings shall be factory manufactured. Shop or field fabricated fittings are not acceptable. Welding fitting shall be "Sypris Tube-Turns" or equivalent. Fittings shall have the same pressure rating as the system in which they are installed.
- 2.06 All valves shall have the same pressure rating as the system in which they are installed and shall be capable of being repacked while wide open and operating at their rated pressure.
- 2.07 MAKEUP WATER
 - A. Copper Tubing: ASTM B88, Type L, hard drawn
 1. Fittings: ANSI/ASME B16.23, cast brass of ANSI/ASME B16.29 solder wrought copper.
 2. Joints: ASTM B32, solder, Grade 95TA
- 2.08 EQUIPMENT CONDENSATE DRAINS (Above Ground)
 - A. Steel Pipe: ASTM A53 or A120, Schedule 40 galvanized.
 1. Fittings: Galvanized cast iron drainage fittings.
 2. Joints: Screwed
 - B. Copper tubing: ASTM B88, Type L, hard drawn.
 1. Fittings: ANSI/ASME B16.23 cast brass, or ANSI/ASME B16.29 solder wrought copper.
 2. Joints: ASTM B32, solder, Grade 95TA.
 - C. PVC Pipe: ASTM D1785, Schedule 40 (Buried)
 1. Fittings: ASTM D2466,
 2. Joints: ASTM D2855, solvent weld.
- 2.09 FLANGES, UNIONS, AND COUPLINGS
 - A. Pipe Size 1-1/2" and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
 - B. Pipe Size 2" and over: 150 psig forged steel slip-on or

weld neck flanges for ferrous piping; bronze flanges for copper piping; 1/16 inch thick preformed neoprene gaskets.

2.10 GATE VALVES

A. Up To and Including 1½ Inches: ANSI Class 150 MSS-SP-80

1. Manufacturers:

- a) Nibco.
- b) Stockham.

2. Bronze body, bronze trim, inside screw, single wedge disc, solder ends.

B. 2" and over:

1. Manufacturers: Class 250 MSS-SP-70

- a) Nibco.
- b) Stockham.

2. Iron body, bronze trim, non-rising stem, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends.

2.11 GLOBE VALVES

A. Up To and Including 2 Inches: ANSI Class 150 MSS-SP-80

1. Manufacturers:

- a) Nibco.
- b) Stockham.

2. Bronze body, bronze trim, rising stem and hand wheel, inside screw, renewable composition disc and bronze seat screwed ends, with back-seating capacity re-packable under pressure.

B. 2" & Over: Class 250 MSS-SP-85

1. Manufacturers:

- a) Nibco.
- b) Stockham.

2. Iron body, bronze trim, bolted bonnet, rising stem, hand wheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.

2.12 BALL VALVES

A. Up To and Including 1½ Inches: ANSI Class 150 SWP MSS-SP-110

1. Manufacturers:
 - a) Lunkenheimer.
 - b) Crane Co.
 2. Bronze one piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends.
- B. 2" & Over: ANSI Class 150 SWP MSS-SP-110
1. Manufacturers:
 - a) Lunkenheimer.
 - b) Crane Co.
 2. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, flanged.
- 2.13 PLUG VALVES (gas piping only)
- A. **PLUG VALVES SHALL NOT BE ACCEPTABLE FOR BALANCING. See 2.18**
- B. Up To and Including 1½ Inches: ANSI Class 150
1. Manufacturers:
 - a) Dezurik.
 - b) Rockwell.
 2. Bronze body, bronze tapered plug, non-lubricated, teflon packing, threaded ends.
 3. Operator: One plug valve wrench for every ten-plug valves minimum of one.
- B. 2" & Over: ANSI Class 250
1. Manufacturers:
 - a) Dezurik.
 - b) Rockwell.
 2. Cast iron body and plug, pressure lubricated, teflon packing, flanged ends.
 3. Operator: Each plug valve with a wrench with set screw.
- 2.14 BUTTERFLY VALVES
- A. Manufacturers:
1. Crane Co.
 2. Keystone Co.
- B. Body: Cast or ductile iron with resilient replaceable EPDM seat for service up to 250 degrees F, lug ends, extended neck.

C. Disc: Aluminum bronze.

D. Operator: 10 position lever handle up to 6" size Gear operator for larger sizes.

2.15 SWING CHECK VALVES

A. Up To and Including 1½" Inches: ANSI Class 150 MSS-SP-80

1. Manufacturers:

- a) Stockham.
- b) Nibco.

2. Bronze body, with composition disc, solder ends, bronze 45 degree (mounted horizontally) and 15 degree (mounted vertically) swing disc.

B. 2" & Over: Class 250 MSS-SP-71

1. Manufacturers:

- a) Stockham.
- b) Nibco.

2. Iron body, bronze trim, bronze or bronze faced 45 degree (mounted horizontally) and 15 degree (mounted vertically) swing disc, renewable disc and seat, flanged ends.

2.16 SPRING LOADED CHECK VALVES

A. Manufacturers:

- 1. Miller Valve Co.
- 2. CPV Co.
- 3. Smolensky Valve Co.

B. Iron body, bronze trim, split plate, hinged with stainless steel spring renewable composition disc, screwed or raised flanged ends.

2.17 RELIEF VALVES

A. Manufacturers:

- 1. Bell and Gosset.
- 2. Armstrong.

B. Bronze body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, or threaded lug ends.

2.18 BALANCING VALVES

A. Manufacturers:

1. Armstrong.
2. Tour and Anderson
3. B&G

B. Bronze body, bronze trim, with metering port and check valves, "Y" pattern, equal percentage globe body. Each valve shall provide: precise flow measurement, shut off, precision flow balancing, no drip seat, and ¼ tapped drain port.

2.19 AUTOMATIC FLOW CONTROL (NOT USED)

1. Basis-of-Design Product: Subject to compliance with requirements, provide or a comparable product by one of the following:
 - Flow Design Inc.
 - Griswold Controls.
 - Bell and Gossett
2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless steel, tamper proof, self cleaning, and removable.
4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
8. Minimum CWP Rating: **175 psig**
9. Maximum Operating Temperature: **200 deg F**

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. Refer to Section 15545

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Install water piping to ASME B31.9.
- C. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipe passing through partitions, walls and floors.
- G. Slope piping and arrange to drain at low points.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 15121.
- I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15260.
- J. Provide access where valves and fittings are not exposed.
- K. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- M. Prepare unfinished pipe, fittings, supports, and accessories, ready for insulation and/or finish painting.
- N. Install valves with stems upright or horizontal, not inverted.
- O. All pipe shall be suitably reinforced at all anchor points. Refer to Section 15140.
- P. Piping shall be installed to minimize turbulence and prevent noise and water hammer. Water piping shall be pitched 1 inch in 60 feet upward direction of flow. Drain piping shall be pitched 1/8 inch per foot down in direction of flow.
- Q. Provide dirt pockets at all heels and low points.
- R. All drain valves shall be located at an elevation not greater than 6'-0" above floor and shall be provided with 3/4 inch hose connections.
- S. Electrolytic couplings or unions shall be installed between dissimilar metals.
- T. All changes in size and direction of piping shall be made with fittings. Do not use miter fittings, bushing, close nipples or street elbows.
- U. Branch connections shall be made with tees. "Weldolets" and "Latrolets" as manufactured by Bonney Forge may be used on steel piping where the branch pipe is at least two nominal pipe sizes less than the main pipe.

- V. All nipples (pipe less than 3 inches long) shall be extra heavy.
- W. Provide operating chains, sprockets and guides within 6'-6" of the floor for valves 6 inch and over, located more than 7'-0" above the floor.
- X. Where valve flange plain face and smooth finish is joined to pipe flange with raised face, grind raised face down smooth. Full face, 1/16 inch thick compressed asbestos gasket shall be provided.
- Y. Provide flanges or unions at all final connections to equipment and control valves.
- Z. Provide offsets and arrange equipment connections allow removal of equipment without disturbing the piping.
- AA. Valves shall be full line size with pipe size reduction only being made at the inlet to the control valve or pump.
- BB. Provide 1-1/2 inch minimum "quick-fill" connections from domestic water supply to all circulating water systems.
- CC. During installation all open ends of piping, valves and equipment shall be plugged.

3.03 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- C. Install gate, butterfly or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe valves for throttling, bypass, or manual flow control services.
- E. Use plug cocks for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.
- F. Use butterfly or ball valves in water systems interchangeably with gate and globe valves.
- G. Use lug end butterfly valves to isolate equipment.
- H. Provide 3/4 inch ball drain valves with hose end connections at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest drain.
- I. Provide plugged cleanouts at all changes in direction of drain lines.
- J. Provide eccentric fittings or couplings where required to prevent pocketing of liquid or non-condensables.
- K. Provide automatic relief valves set 50 psi below rated pressure of all pressure vessels.

3.04 CLEANING

- A. Provide temporary screens at connections to all equipment and automatic control valves where permanent strainers are not provided.
- B. Provide chemical cleaning operation similar to Olin Water Service "Cleanout" to all water systems.
- C. Cleansing agent and cleaning preparation shall be in accordance with the manufacturers recommendation.
- D. Provide temporary receivers or drums to accommodate foam that may form, or to remove cleansing agent in accordance with manufacturer's recommendation and in compliance with environmental protection agency (EPA).
- E. Drain system, flush with clean water, clean strainers, screens and refill system. Operate system a minimum of three days with cheesecloth bonded to the baskets on the pump strainers. Cheesecloth filters shall be changed each day. Upon completion of cleaning remove cheesecloth filters from all strainers.

3.05 TESTING

- A. Test system at 1-1/2 times the working pressure with a minimum of 100 psi for 24 hours. Isolate all equipment which may be damaged during testing.
- B. Contractor to notify Engineer for witnessing.

END OF SECTION

SECTION 232114
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Expansion tanks.
- B. Air vents.
- C. Air separators.
- D. Strainers.
- E. Pump suction fittings.
- F. Relief valves.

1.02 RELATED SECTIONS

- A. Section 23 21 13 - Hydronic Piping.

1.03 REFERENCES

- A. ASME - Boilers and Pressure Vessel Codes, SEC 8-D-Rules for Construction of Pressure Vessels.

1.04 SUBMITTALS

- A. Submit under provisions of contract.
- B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model dimensions and weights.
- C. Submit inspection certificates for pressure vessels from ASME and required by any other authority having jurisdiction.
- D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Manufacturer: For each product specified, provide components by same manufacturer throughout the work of this project.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of the Contract.

PART 2 PRODUCTS

2.01 EXPANSION TANKS

1. Open Expansion Tanks

A. Manufacturers:

1. Bell and Gossett.

Other acceptable manufacturers offering equivalent products.

a) Armstrong.

b) John Woods.

B. Construction: Closed, welded steel, tested and stamped in accordance with ASME SEC 8-D; cleaned, prime coated, and supplied with steel support saddles; with tapings for installation of accessories.

C. Gage Glass Set: Brass compression stops, guard, and 3/4 inch red line glass, maximum 24 inches length, long enough to cover tank for 2 inches above bottom to 2 inches below top.

D. Automatic Cold Water Fill Assembly: Pressure reducing valve, double check back flow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

E. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig working pressure and 250 deg F maximum operating temperature.

F. Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig working pressure and 240 deg F maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.

2. Diaphragm Bladder-Type Expansion Tanks:

A. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature. Factory test with taps fabricated and supports installed and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

B. Diaphragm Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.

C. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats

2.03 AIR VENTS

- A. Manual Type: Vertical sections of 1-1/2 inch diameter pipe approximately 6 inches long to form air chamber, with 1/4 inch brass cock top of chamber.
- B. Float Type:
 - 1. Manufacturers:
 - a) Bell and Gossett.
 - b) Armstrong.
 - c) John Woods.
 - 2. Brass or semi-steel body, copper, float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
 - 3. Provide full size vent/drain from automatic vent valve to nearest building system drain.

2.04 AIR SEPARATORS

- A. Dip Tube Fitting:
 - 1. Manufacturers:
 - a) Bell and Gossett.
 - b) Armstrong.
 - c) John Woods.
 - 2. For 125 psig operating pressure; to prevent free air collected in boiler from rising into system.
- B. In-line Air Separators:
 - 1. Manufacturers:
 - a) Bell and Gossett.
 - b) Armstrong.
 - c) John Woods.
 - 2. Cast iron for sizes 1-1/2 inch and smaller, or steel for sizes 2 inch and larger; tested and stamped in accordance with ASME SEC 8-D; for 175 psig operating pressure.
- C. Air Elimination Valve: Bronze, float operated, for 175 psig operating pressure.
- D. If pump suction diffuser is provided with a strainer none is required at the air separator.
- E. Tangential-Type Air Separators:
 - 1. Tank: Welded steel; ASME constructed and labeled for 125-psig minimum working pressure and 375 deg maximum operating temperature

2. Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank.
3. Tangential Inlet and Outlet Connections: Threaded for NPS 2 and smaller; flanged connections for NPS 2-1/2 and larger.
4. Blow-down Connection: Threaded with ball valve
5. Size: Match system flow capacity.

F Air Purgers:

Body: Cast iron with internal baffles that slow the water velocity to separate the air from solution and divert it to the vent for quick removal. Maximum Working Pressure: 150 psig. Maximum Operating Temperature: 250 deg F.

2.05 STRAINERS

A. Size 1 1/2 inch and Under:

1. Manufacturers:
 - a) Armstrong.
 - b) Zurn Industries, Inc.
 - c) Spirax/Sarco, Inc.
2. Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 2 inch to 4 inch:

1. Manufacturers:
 - a) Armstrong.
 - b) Zurn Industries, Inc.
 - c) Spriax/Sarco, Inc.
2. Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

C. Size 5 inch and Larger:

1. Manufacturers:
 - a) Armstrong.
 - b) Zurn Industries.
 - c) Spriax/Sarco, Inc.
2. Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.06 PUMP SUCTION FITTINGS

- A. Provide pump suction fittings furnished by pump manufacturer as integral part of pump package.
- B. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psig working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.
- C. Accessories: Adjustable foot support, blowdown tapping in bottom, gage tapping in side.

2.7 RELIEF VALVES

- A. Manufacturers:
 - 1. Bell & Gosset.
 - 2. Armstrong.
 - 3. Watts Regulator Company.
- B. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.8 DIELECTRIC FITTINGS

- B. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- C. Insulating Material: Suitable for system fluid, pressure, and temperature.
- D. Dielectric Unions:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Hart Industries International, Inc.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - e. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.
 - 2. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.
- E. Dielectric Flanges:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
3. Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

F. Dielectric Couplings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Calpico, Inc.
 - b. Lochinvar Corporation.
2. Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F

G. Dielectric Nipples:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Perfection Corporation; a subsidiary of American Meter Company.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. Victaulic Company of America.

2.9 CHEMICAL TREATMENT

- A. Bypass Chemical Feeder: Welded steel construction; ASME rated 125-psig working pressure; 5-gal. capacity; with fill funnel and inlet, outlet, and drain valves.
 1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.
 2. Propylene Glycol: Industrial grade with corrosion inhibitors and environmental-stabilizer additives for mixing with water in systems indicated to contain antifreeze or glycol solutions.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions.

- B. Where large air quantities can accumulate, provide enlarged air collection standpipes (air chambers) with vent valves.
- C. Provide manual air vents at system high points, including at the top of all supply and return risers and as indicated plan and in details.
- D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- E. Provide tangential air separator on suction side of system secondary circulation pumps and connect to expansion tank.
- F. Provide valved drain and hose connection on strainer blow down connection.
- G. Provide strainers on the suction side of all pumps or strainers in the inlet guides to all pumps. Provide gate or butterfly shut-off valves on suction side of all strainers and the discharge side of all pumps. Provide balancing and check valves on the discharge side of all pumps. Alternatively, provide triple duty valves instead of shutoff-balance-check. In addition, provide temporary insert screen strainers at the inlet to pumps and remove after cleaning systems.
- H. Provide thermometers and wells on the suction side, and pressure gauges on both the inlet and outlet of all pumps.
- K. Support pump fittings with floor mounted pipe and flange supports.
- L. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.
- M. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment. Pipe relief valve outlet to nearest floor drain.
- N. Pipe relief valve outlet to nearest floor drain.
- O. Provide separate vent lines for each relief valve. Common vent lines for more than one relief valve are not permitted.
- P. The new hot water and chilled water plants shall be filled with a mixture of 35% Propylene Glycol. Upon completion of all phases of installation of the new hot water and chilled water plants, the both systems shall be sampled to determine the glycol content. Add glycol as required to ensure the mixture is 35%.
- Q. Pre-charged expansion tanks are charged to 12 psi from the factory. The hot water and chilled water expansion tanks need to be charged to 24 psi before being installed and filled.

END OF SECTION

November 6, 2020
Contract No. 16-529

Main House Renovations Lasdon Park
Arboretum and Veterans Memorial

SECTION 232123
HYDRONIC PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Inline pumps.
- B. Base Mounted Pumps

1.02 RELATED SECTIONS

- A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.
- B. Section 23 05 48 - Vibration Controls for HVAC Equipment and Piping.
- C. Section 23 07 19 - HVAC Piping Insulation.
- D. Section 23 07 16 - HVAC Equipment Insulation.
- E. Section 23 21 13 - Hydronic Piping.
- F. Section 23 21 14 - Hydronic Specialties.

1.03 REFERENCES

- A. UL 778 - Motor Operated Water Pumps.
- B. NFPA 70 - National Electrical Code.

1.04 PERFORMANCE REQUIREMENTS

- A. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- B. Alignment: Base mounted pumps shall be aligned by qualified millwright and alignment certified.

1.05 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

1.06 EXTRA MATERIALS

- A. Furnish under provisions of contract.
- B. Provide one set of mechanical seals for each pump.

PART 2 PRODUCTS

2.01 PRODUCTS

- A. ITT Bell & Gossett. Armstrong Pumps Inc
- B. Other acceptable manufacturers offering equivalent products.
 - 1. ITT Bell & Gossett.
 - 2. Aurora Pump.
 - 3. Taco.

2.02 GENERAL CONSTRUCTION REQUIREMENTS

- A. Balance: Rotating parts, statically and dynamically.
- B. Construction: To permit servicing without breaking piping or motor connections.
- C. Pump Motors: Operate at 1750 rpm unless specified otherwise. Refer to Section 230513.
- D. Pump Connections: Flanged.
- E. Provide nameplates attached to pumps indicating manufacturer, date of manufacture, model number, size, capacity, head, RPM, impeller diameter, impeller model, number of stages and direction of rotation.

2.03 IN-LINE PUMPS

- A. Furnish and installed with capacities as shown on plans. Pumps shall be in-line type, close-coupled single stage design, for installation in vertical or horizontal position, and capable of being serviced without disturbing piping connections.
- B. Pump casing shall be of Class 30 cast iron. The impeller shall be cast bronze, closed type, dynamically balanced, keyed to the shaft and secured by locking cap-screw.
- C. The liquid cavity shall be sealed off at the motor shaft by an internally-flushed mechanical seal with ceramic seal seat and carbon seal ring, suitable for continuous operation at 225 deg. F. A bronze shaft sleeve shall completely cover the wetted area under the seal.
- D. Pumps shall be rated for minimum of 175 psi working pressure. The pump case shall have gauge tapings at the suction and discharge nozzels and will include vent and drain ports.

- E. Motor shall meet NEMA specifications and shall be the size, voltage and enclosure called for on the plans. It shall have heavy-duty, grease lubricated ball bearings, completely adequate for the maximum load for which the pump is designed.
- F. Each pump shall be factory tested per Hydraulic institute standards. It shall then be thoroughly cleaned and painted with at least one coat of high-grade machinery enamel prior to shipment.

2.04 BASE MOUNTED END SUCTION PUMPS

- A. Type: Horizontal Shaft, base mounted, single stage, close coupled, radially split or direct connected horizontally split casing for 175 psig working pressure.
- B. Casing: Cast iron ASTM B-159, with suction and discharge gage port, casing wear ring, seal flush connection, drain plug, flanged suction and discharge.
- C. Impeller: Bronze ASTM B-504, fully enclosed, keyed directly to motor shaft or extension.
- D. Shaft: Alloy steel with aluminum bronze ASTM #B-111 sleeve.
- E. Seal: Internally flushed mechanical seal with carbon rotating against a stationary ceramic seat, Buna N 225° F maximum continuous operating temperature.
- F. Performance: As indicated on drawings.
- G. Pump Bearings: Grease-lubricated ball bearings contained in cast-iron housing with grease fittings.
- H. Shaft Coupling: Molded rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor. Or EPDM coupling sleeve for variable-speed applications.
- I. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.
- J. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.
- K. Motor: Single speed, Single speed, with permanently lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing. Comply with requirements in Division 23 Section section 230513 Common motor requirements.

2.05 CLOSE – COUPLED, END SUCTION PUMPS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Armstrong Pumps Inc.

2. Buffalo Pumps, Inc.
3. ITT Corporation; Bell & Gossett.
4. ITT Corporation; Goulds Pumps.
5. PACO Pumps.
6. Patterson Pump Co.; a subsidiary of the Gorman-Rupp Co.
7. Peerless Pump Company.
8. TACO Incorporated.
9. Thrush Company Inc.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally.

C. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, drain plug at bottom and air vent at top of volute, threaded gage tappings at inlet and outlet, and flanged connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.
3. Pump Shaft: Stainless steel.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket. Include water slinger on shaft between motor and seal.
5. Pump Bearings: Permanently lubricated ball bearings.

D. Motor: Single speed and rigidly mounted to pump casing with integral pump support.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - a. Enclosure: Open, dripproof.
 - b. Enclosure Materials: Cast iron.
 - c. Motor Bearings: Permanently lubricated ball bearings.
 - d. Unusual Service Conditions
 - e. Efficiency: Premium efficient.
 - f. Service Factor: 1.2
 - g. Inverter duty rated.

2.6 SEPARATELY COUPLED, BASE-MOUNTED, DOUBLE-SUCTION CENTRIFUGAL PUMPS

E. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Pumps, Inc.
 2. ITT Corporation.
 3. Mepco, LLC.
 4. PACO Pumps; Grundfos Pumps Corporation, USA.
 5. Patterson Pump Company; a Gorman-Rupp company.
 6. TACO Incorporated.
- F. Description: Factory-assembled and -tested, centrifugal, impeller-between-bearings, separately coupled, double-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for base mounting, with pump and motor shafts horizontal.
- G. Pump Construction:
1. Casing: Horizontally split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and ASME B16.1, Class 250 flanges. Casing supports shall allow removal and replacement of impeller without disconnecting piping.
 2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, and keyed to shaft. For pumps not frequency-drive controlled, trim impeller to match specified performance.
 3. Pump Shaft: Stainless steel.
 4. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
 5. Pump Bearings: Grease-lubricated ball bearings in cast-iron housing with grease fittings.
- H. Shaft Coupling: Molded-rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor. EPDM coupling sleeve for variable-speed applications.
- I. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.
- J. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.
- K. Motor: Variable speed, secured to mounting frame, with adjustable alignment.
1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - a. Enclosure: Open, dripproof.
 - b. Enclosure Materials: Cast iron.
 - c. Motor Bearings: Grease lubricated.
 - d. Premium efficiency
 - e. Inverter duty

2.07 PUMP SPECIALTY FITTINGS

A. Suction Diffuser:

1. Angle pattern.
2. 175-psig pressure rating, cast-iron body and end cap, pump-inlet fitting.
3. Bronze startup and bronze or stainless-steel permanent strainers.
4. Bronze or stainless-steel straightening vanes.
5. Drain plug.
6. Factory-fabricated support.

B. Triple-Duty Valve:

1. Angle or straight pattern.
2. 175-psig pressure rating, cast-iron body, pump-discharge fitting.
3. Drain plug and bronze-fitted shutoff, balancing, and check valve features.
4. Brass gage ports with integral check valve and orifice for flow measurement.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.
- C. Provide line sized shut-off valve suction fitting and strainer on pump suction, and line sized check valve, balancing valve on pump discharge.
- D. Lubricate pumps before start-up.
- E. Balance impellers and all other moving components statically and dynamically. Where components are or may come in contact although the materials may basically be similar, use hardness differentials of at least 50 Brinell to prevent seizure and reduce wear.
- F. Provide seals compatible with the pump design, fluid handled, and in accordance with the manufacturers' recommendations. Provide water supply for cooling and lubrication of seals as required.
- G. Provide casing connections for vent, drain, suction and discharge pressure gauges.
- H. Provide automatic air vent on casing when pump is operated at a suction pressure below atmospheric.

- I. All vents, bleeds, gland and base drains, and blow-off connections shall be piped to nearest floor drain using copper tubing.
- J. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.
- K. Equipment Mounting: Install base-mounted pumps on cast-in-place concrete equipment bases. Comply with requirements for equipment bases specified in section 230548.
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct bases to withstand, without damage to equipment, seismic force required by code.
 - 3. Construct concrete bases 6 inches high and extend base not less than 6 inches in all directions beyond the maximum dimensions of base-mounted pumps unless otherwise indicated or unless required for seismic-anchor support.
 - 4. Minimum Compressive Strength: 5000 psi at 28 days.

3.03 OPERATING CHARACTERISTICS

- A. Match centrifugal pump impellers and casings so that at specified operating conditions the impeller diameter is not more than 72% of the cut water diameter or 85% of the maximum cataloged impeller size, whichever is less. Pump operating characteristic curves must meet the following requirements:
 - 1. The pump NPSH requirement shall be less than the available system NPSH.
 - 2. The pump operating point shall fall below the point of no flow head pressure.
 - 3. Pump shall operate at or near the point of peak efficiency. Pump curve shall be continuously rising from design capacity up to shut-off point to ensure stable operation and prevent any possibility of hunting.
- B. Furnish pumps so that when operating at rated rpm the pump motor cannot be overloaded despite variations in pumping head over entire range of curve. Brake horsepower and motor horsepower shall conform with the equipment schedule. If a particular manufacturer's selection cannot conform to the above any mechanical or electrical adjustments necessitated by a larger motor shall be at no cost to the Owner and shall be subject to review by the Engineer.

3.04 TESTS

- A. Factory Tests
 - 1. Before shipment, the manufacturer shall test all components hydrostatically at 150% of rated design pressure for ability to withstand maximum design pressures and for tightness.
- B. Field Tests
 - 1. Perform field test to demonstrate the ability of the pumping equipment to meet contract requirements. Compile and certify the following data as a minimum:

- a) Water flow, gpm at rated head.
 - b) Shut-off head.
 - c) Operating kilowatts from measured voltage, amperes and power factor at rated head.
2. Should any part of the apparatus or system fail to meet the contract requirements, adjust, repair or replace any and all defective or inoperative parts and, on completion, again conduct the complete performance tests.
 3. Refer to Section 290593 for additional required pump test data.

END OF SECTION

SECTION 23 23 00
REFRIGERANT PIPING AND SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Check valves.
- G. Pressure relief valves.
- H. Filter-driers.
- I. Solenoid valves.
- J. Expansion valves.
- K. Receivers.
- L. Flexible connections.

1.02 RELATED SECTIONS

- A. Section 23 07 13 - HVAC Piping Insulation.
- B. Section 23 07 16 - HVAC Equipment Insulation.

1.03 REFERENCES

- A. ARI 495 - Refrigerant Liquid Receivers.
- B. ARI 710 - Liquid Line Dryers.
- C. ARI 730 - Flow-Capacity Rating and Application of Suction-Line Filters and Filter-Driers
- D. ARI 750 - Thermostatic Refrigerant Expansion Valves.
- E. ARI 760 - Solenoid Valves for Use With Volatile Refrigerants.
- F. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
- G. ASHRAE 34 - Number Designation of Refrigerants.
- H. ASME - Boiler and Pressure Vessel Codes, SEC 9 - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
- I. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

- J. ASME B16.26 - Cast Copper Alloy Fittings For Flared Copper Tubes.
- K. ASME B31.5 - Refrigeration Piping.
- L. ASME B31.9 - Building Services Piping.
- M. ASME SEC 8D - Boilers and Pressure Vessels Code, Rules for Construction of Pressure Vessels.
- N. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- O. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- P. ASTM B88 - Seamless Copper Water Tube.
- Q. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- R. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
- S. AWS A5.8 - Brazing Filler Metal.
- T. AWS D1.1 - Structural Welding Code, Steel.
- U. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
- V. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
- W. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- X. UL 429 - Electrically Operated Valves.
- Y. MIL-I-631C – Construction at Solenoid Valve Coils
- Z. MIL-V-2345OC – Valves, Expansion, Thermostatic, Refrigerant 12 and Refrigerant 22.

1.04 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASTM B31.5 unless indicated otherwise.
- C. Liquid Indicators:
 - 1. Use line size liquid indicators in main liquid line leaving condenser.
 - 2. If receiver is provided, install in liquid line leaving receiver.
 - 3. Use line size on leaving side of liquid solenoid valves.
- D. Valves
 - 1. Use service valves on suction and discharge of compressors.
 - 2. Use gage taps at compressor inlet and outlet.

3. Use gage taps at hot gas bypass regulators, inlet and outlet.
 4. Use check valves on compressor discharge.
 5. Use check valves on condenser liquid lines on multiple condenser systems.
- E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.
- F. Strainers:
1. Use line size strainer upstream of each automatic valve.
 2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
 3. On steel piping systems, use strainer in suction line.
 4. Use shut-off valve on each side of strainer.
- G. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.
- H. Permanent Filter-Driers:
1. Use in low temperature systems.
 2. Use in systems utilizing hermetic compressors.
 3. Use filter-driers for each solenoid valve.
- I. Replaceable Cartridge Filter-Driers:
1. Use vertically in liquid line adjacent to receivers.
 2. Use filter-driers for each solenoid valve.
- J. Solenoid Valves:
1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
 2. Use in liquid line of single or multiple evaporator systems.
 3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.
- K. Receivers:
1. Use on systems 5 tons (18 kW) and larger, sized to accommodate pump down charge.
 2. Use on systems with long piping runs.
- L. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.05 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Shop Drawings: Indicate schematic layout of refrigerant piping and AC systems, including equipment, critical dimensions, and sizes.

- C. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.
- D. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- E. Test Reports: Indicate results of leak test, acid test.
- F. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Deliver and store piping and specialties in shipping containers with labeling in place.
- C. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- D. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 PIPING

- A. Copper Tubing: ASTM B280, Type ACR hard drawn.
 - 1. Fittings: ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.
- B. Copper Tubing to 7/8 inch OD: ASTM B88, Type K, annealed.
 - 1. Fittings: ASME B16.26 cast copper.
 - 2. Joints: Flared.

2.02 REFRIGERANT

- A. Refrigerant: ASHRAE 34;
 - 1. R-410A

2.03 MANUFACTURERS

- A. Keep - Rite
- B. Henry Valve Company

- C. Sporlan Company
- D. Substitutions: Under provisions of the contract documents.

2.04 MOISTURE AND LIQUID INDICATORS

- A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator and plastic cap; for maximum working pressure of 500psi, and maximum temperature of 200 degrees F.

2.05 VALVES

- A. Diaphragm Packless Valves: UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275° F.
- B. Packed Angle Valves: Forged brass, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275° F.
- C. Packed Ball Valves: Two piece bolted forged brass Body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300° F.

2.06 STRAINERS

- A. Straight Line or Angle Line Type: Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

2.07 CHECK VALVES

- A. Straight Thru Type: Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi and maximum temperature of 250° F.

2.08 PRESSURE RELIEF VALVES

- A. Straight Thru or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB. Setting in conformance with ANSI/ASHRAE 15.

2.09 FILTER-DRIERS

- A. Replaceable Cartridge Angle Type: ANSI/ARI 710, UL listed, brass shell and bronze cap, perforated brass shell and bronze cap, perforated brass shell and molded desiccant filter core; for maximum working pressure of 350 psi.
- B. Permanent Straight Thru Type: ANSI/ARI 710, UL listed, steel shell with molded desiccant filter core, for maximum working pressure of 350 psi.

2.10 SOLENOID VALVES

- A. Valve: ARI 760, pilot operated, copper or brass body and internal parts, synthetic seat, stainless steel stem and plunger assembly, with flared, solder, or threaded ends; for maximum working pressure of 500 psi. Stem shall permit manual operation in case of coil failure.
- B. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box.

2.11 EXPANSION VALVES

- A. Angle or Straight Thru Type: Design suitable for refrigerant, brass body, internal or external equalizer, adjustable superheat setting, replaceable inlet strainer, with capillary tube and remote sensing bulb.
- B. Selection: As per equipment manufacturer.

2.12 RECEIVERS

- A. Internal Diameter 6" and Smaller: ANSI/ARI 495, UL listed, steel, brazed; 500 psi maximum pressure rating, with tappings for inlet, outlet, and pressure relief valve.
- B. Internal Diameter Over 6" and Smaller: ANSI/ARI 495, welded steel, tested and stamped in accordance with Section 8D of the ANSI/ASME Boiler and Pressure Vessels Code; 500 psi with tappings for inlet, outlet and pressure relief valve.

2.13 FLEXIBLE CONNECTORS

- A. Corrugated stainless steel bronze hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 500 psi.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Provide access to concealed valves and fittings.
- I. Flood piping system with nitrogen when brazing.
- J. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.
- K. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 230500 Common work results for HVAC
- L. Insulate piping and equipment; refer to Section 230700 and Section 230701.
- M. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.
- N. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
- O. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
- P. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
- Q. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.
- R. Fully charge completed system with refrigerant after testing.
- S. Provide electrical connection to solenoid valves. .

3.03 FIELD QUALITY CONTROL

- A. Test refrigeration system in accordance with ASME B31.5.
- B. Pressure test system with dry nitrogen to 200 psig. Perform final tests at 27 inches vacuum and 200 psig using halide torch. Test to no leakage.

November 6, 2020
Contract No. 16-529

Main House Renovations Lasdon Park
Arboretum and Veterans Memorial

END OF SECTION

SECTION 232500
HVAC WATER TREATMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cleaning of piping systems.
- B. Treatment for closed systems.

1.02 RELATED SECTIONS

- A. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.
- B. Section 23 21 13 - Hydronic Piping.

1.03 SUBMITTALS

- A. Submit shop drawings under provisions of Section 01300.
- B. Submit shop drawings indicating system schematics, equipment locations, and controls schematics.
- C. Submit product data under provisions of Section 15010.
- D. Submit product data indicating chemical treatment materials, chemicals, and equipment.
- E. Submit manufacturer's installation instructions under provisions of Section 15010.
- F. Submit manufacturer's field reports under provisions of Section 15010.
- G. Submit reports indicating start-up of treatment systems is completed and operating properly.
- H. Submit reports indicating analysis of system water after cleaning and after treatment.

1.04 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 15010 and Division 1.
- B. Include step-by-step instructions on test procedures including target concentrations.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section
With minimum ten years documented experience. Company shall have local representatives with water analysis laboratories and full time service personnel.

1.06 REGULATORY REQUIREMENTS

- A. Conform to EPA code for addition of non-potable chemicals to building mechanical systems, and for delivery to public sewage systems.

1.07 MAINTENANCE SERVICE

- A. Furnish service and maintenance of treatment systems for one year from Date of Substantial Completion.
- B. Provide technical service visits to perform field inspections and make water analysis on site.
Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.
- C. Provide laboratory and technical assistance services for warranty period.
- D. Provide on site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based upon these inspections.
- E. Strainers and equipment low points shall be periodically observed to strain out loosened debris.
- F. The system shall be operated for a minimum of three days after the introduction of water
Treatment with cheesecloth bonded to strainer baskets.

1.08 MAINTENANCE MATERIALS

- A. Provide sufficient chemicals for treatment and testing during warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Heating Economy Service Co.
- B. Metropolitan Refining Co., Inc.
- C. Mogul Division; Dexter Corp.

2.02 MATERIALS

- A. System Cleaner:
 - 1. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.
- B. Closed System Treatment (Water):

1. Sequestering agent to reduce deposits and adjust pH. Also include Corrosion inhibitors and conductivity enhancers.

2.03 EQUIPMENT

- A. By-pass (Pot) Feeder: 5.0 gal. quick opening cap for working pressure of 175 psig; typical for two (2).

2.04 TEST EQUIPMENT

- A. Provide white enamel test cabinet with local and fluorescent light, capable of accommodating 4 – 10 ml zeroing titrating burettes and associated reagents.
- B. Provide the following test kits:
 1. Chloride titration test kit.
 2. Total hardness titration test kit.
 3. Low phosphate test kit.
 4. Creosol red pH slide complete with reagent.
 5. High nitrite test kit.
- C. Corrosion Test-Coupon Assembly: Constructed of corrosive-resistant material, complete with piping, valves, and mild steel and copper coupons. Locate copper coupon downstream from mild steel coupon in the test-coupon assembly.
 1. 4 station rack for open systems.

PART 3 EXECUTION

3.01 PREPARATION

- A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.
- B. Place terminal control valves in open position during cleaning.

3.02 CLEANING SEQUENCE

- A. Add cleaner to the Dual temperature water closed systems at concentration as recommended by manufacturer.
- B. Circulate for 48 hours then drain quickly as possible. Refill with clean water and circulate for 24 hours then drain. Refill and repeat procedure until system cleaner is removed. Use neutralizing agents as recommended by the supplier. Clean strainers and screens after each cycle.
- C. Isolate chiller, boiler and thoroughly clean and flush to remove all mill scale and oil. Verify chemical compatibility with the chiller and boiler manufacturer prior to cleaning. Petroleum based cleaners shall not be used.

3.03 SYSTEM TREATMENT

- A. Provide bypass type feeder for the hot water system. Install isolation valves and drain valves as well all necessary piping and connect into the water systems as per manufacturer's recommendations. Chemicals shall be introduced when need is indicated by sample testing.
- B. All new and existing heating hot water piping and new refrigerant piping shall be cleaned prior to be placed into service with new or existing equipment.

END OF SECTION

SECTION 232913
VARIABLE FREQUENCY DRIVES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Variable frequency drives.

1.02 RELATED SECTIONS

- A. Section 23 21 23 - Hydronic Pumps.
- B. Section 16195 - Electrical Identification: Engraved nameplates.

1.03 REFERENCES

- A. Division 1 - Reference Standards: Requirements for references and standards.
- B. NEMA ICS 3.1 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems.
- C. NEMA ICS 7 - Industrial Control and Systems: Adjustable Speed Drives.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).
- F. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS FOR REVIEW

- A. Division 1 - Submittals: Procedures for submittals.
- B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and over current protective devices, short circuit ratings, dimensions, and enclosure details.
- C. Shop Drawings: Indicate front and side views of enclosures with overall dimensions and weights shown; conduit entrance locations and requirements; and nameplate legends.

1.05 SUBMITTALS FOR INFORMATION

- A. Division 1 - Submittals: Submittals for information.
- B. Test Reports: Indicate field test and inspection procedures and test results.

- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
- D. Manufacturer's Field Reports: Indicate start-up inspection findings.

1.06 SUBMITTALS FOR CLOSEOUT

- A. Division 1 - Contract Closeout.
- B. Operation Data: NEMA ICS 3.1. Include instructions for starting and operating controllers, and describe operating limits that may result in hazardous or unsafe conditions.
- C. Maintenance Data: NEMA ICS 3.1. Include routine preventive maintenance schedule.
- D. Furnish two of each air filters.

1.07 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Division 1 - Material and Equipment: Transport, handle, store, and protect products.
- B. Accept controllers on site in original packing. Inspect for damage.
- C. 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.
- D. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to components, enclosure, and finish.

1.09 MAINTENANCE SERVICE

- A. Division 1 - Contract Closeout.
- B. Provide service and maintenance of controller for two years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Equipment and devices can be provided by Danfoss Graham VLT 6000 Series 414-355-8800.

- B. Manufacturer Qualifications: Company specializing in manufacturing variable frequency controllers with minimum five years documented experience, and with service facilities within 50 miles of Project.

2.02 DESCRIPTION

- A. Enclosed variable frequency controllers suitable for operating the indicated loads, in conformance with requirements of NEMA ICS 7.
- B. Select unspecified features and options in accordance with NEMA ICS 3.1.
- C. Furnish complete variable frequency VFDs as specified herein for the pumps designated on the drawing schedules to be variable speed. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. VFD shall be housed in a metal NEMA 1 enclosure, or other NEMA type according to the installation and operating conditions at the job site. The VFD's UL listing shall allow mounting in plenum or other air handling compartments. If a NEMA 12 enclosure is required for the plenum rating, the manufacturer must supply a NEMA 12 rated VFD. VFD's used out doors must be in a NEMA 4x rated enclosure.
- D. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump and fan control and to eliminate the need for motor derating.
- E. With the motor's rated voltage applied to the VFD input, the VFD shall allow the motor to produce full rated power at rated amps, RMS fundamental volts, and speed without using the motor's service factor. VFDs utilizing sine weighted/coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.
- F. The VFD shall include an input full-wave bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.
- G. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be assembled by the manufacturer, which shall be UL-508 certified for the building and assembly of option panels. Assembly of the option panels by a third-party panel shop is not acceptable. The appropriate UL stickers shall be applied to both the VFD and option panel, in the case where these are not contained in one panel. When these VFDs are to be located in Canada, CSA or C-UL certifications shall apply. Both VFD and option panel shall be manufactured in ISO 9001 certified facilities.
- H. The VFD shall have DC link reactors on both the positive and negative rails of the DC bus to minimize power line harmonics. VFDs without DC link reactors shall provide a minimum 3% impedance line reactor.
- I. The VFD's full load amp rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 second while starting.

- J. The VFD shall be able to provide full torque at any selected frequency from 28 Hz to base speed to allow driving direct drive fans without derating.
- K. An automatic energy optimization selection feature shall be provided standard in the VFD. This feature shall automatically and continually monitor the motor's speed and load and adjust the applied voltage to maximize energy savings and provide up to an additional 3% to 10% energy savings.
- L. Input and output power circuit switching shall be able to be accomplished without interlocks or damage to the VFD. Switching rate may be up to 1 time per minute on the input and unlimited on the output.
- M. An automatic motor adaptation test algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or de-couple the motor from the load to run the test.
- N. Galvanic and/or optical isolation shall be provided between the VFD's power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. VFDs not including either galvanic or optical isolation on both analog I/O and discrete I/O shall include additional isolation modules.
- O. VFD shall minimize the audible motor noise through the use of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted to optimize motor and VFD efficiencies while reducing motor noise.

2.03 PROTECTIVE

FEATURES

- A. A minimum of Class 20 I²t electronic motor overload protection for single motor applications and thermal-mechanical overloads for multiple motor applications shall be provided.
- B. Protection against input transients, loss of AC line phase, output short circuit, output ground fault, over voltage, under voltage, VFD over temperature and motor over temperature. The VFD shall display all faults in plain English. Codes are not acceptable.
- C. Protect VFD from sustained power or phase loss. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD will continue to operate with reduced output with an input voltage as low as 164 V AC for 208/230 volt units, and 313 V AC for 460 volt units.
- D. The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.
- E. VFD package shall include semi-conductor rated input fuses to protect power components.
- F. To prevent breakdown of the motor winding insulation, the VFD shall be designed to comply with IEC Part 34-17. Otherwise the VFD manufacturer must ensure that inverter rated motors are supplied.

- G. VFD shall include a “signal loss detection” circuit to sense the loss of an analog input signal such as 4 to 20 mA or 2 to 10 V DC, and shall be programmable to react as desired in such an instance.
- H. VFD shall function normally when the keypad is removed while the VFD is running and continue to follow remote commands. No warnings or alarms shall be issued as a result of removing the keypad.
- I. VFD shall catch a rotating motor operating forward or reverse up to full speed.
- J. VFD shall be rated for 100,000 amp interrupting capacity (AIC).
- K. VFD shall include current sensors on all three output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.
- L. VFD shall continue to operate without faulting until input voltage reaches 300 V AC on 208/230 volt VFDs, and 539 V AC on 460 volt VFDs.
- M. All three pole variable frequency controllers (VFD) either integral to equipment or field supplied shall contain voltage fault protection specifically designed to protect all motors and all other 3 phase loads, and associated control circuits from failure or damage due to voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling.” The VFD shall be arranged to monitor critical faults including phase loss or reversal, and when detected, de-energize the load. It shall monitor non-critical faults including high/low voltage, voltage unbalance and when detected, after a time delay de-energize the load.”

2.04 INTERFACE

FEATURES

- A. Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the VFD and determine the speed reference.
- B. The VFD shall be able to be programmed to provide a 24 V DC output signal to indicate that the VFD is in Auto/Remote mode.
- C. The VFD shall provide digital manual speed control. Potentiometers are not acceptable.
- D. Lockable, alphanumeric backlit display keypad can be remotely mounted up to 10 feet away using standard 9-pin cable.
- E. The keypads for all sizes of VFDs shall be identical and interchangeable.
- F. To set up multiple VFDs, it shall be possible to upload all setup parameters to the VFD’s keypad, place that keypad on all other VFDs in turn and download the setup parameters to each VFD. To facilitate setting up VFDs of various sizes, it shall be possible to download from the keypad only size independent parameters.
- G. Display shall be programmable to display in 9 languages including English, Spanish and French.

- H. The display shall have four lines, with 20 characters on three lines and eight large characters on one line.
- I. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.
- J. A quick setup menu with factory preset typical HVAC parameters shall be provided on the VFD eliminating the need for macros.
- K. The VFD shall include a standard RS-485 communications port and capabilities to be connected at a future date to a Johnson Controls N2 Metasys or Siemens FLN system at no additional cost to the owner. The connection shall be software selectable by the user.
- L. As a minimum, the following points shall be controlled and/or accessible:
 - 1. VFD Start/Stop
 - 2. Speed reference
 - 3. Fault diagnostics
 - 4. Meter points
 - a. Motor power in HP
 - b. Motor power in kW
 - c. Motor kW-hr
 - d. Motor current
 - e. Motor voltage
 - f. Hours run
 - g. Feedback signal #1
 - h. Feedback signal #2
 - i. DC link voltage
 - j. Thermal load on motor
 - k. Thermal load on VFD
 - l. Heat sink temperature
 - 5. Four additional Form C 230 volt programmable relays shall be available for factory or field installation within the VFD.
- M. The communication protocol shall be native BACNET, LonWorks communication shall be available for factory or field installation within the VFD.
- N. Two set-point control interface (PID control) shall be standard in the unit. VFD shall be able to look at two feedback signals, compare with two set-points and make various process control decisions.
- O. An output signal as a start command to actuate external equipment before allowing the VFD to start.
- P. The following displays shall be accessible from the control panel in actual units: Reference Signal Value in actual units, Output Frequency in Hz or percent, Output Amps, Motor HP, Motor kW, kWhr, Output Voltage, DC Bus Voltage, VFD Temperature in degrees, and Motor Speed in engineering units per application (in GPM, CFM, etc.). VFD will read out

the selected engineering unit either in a linear, square or cubed relationship to output frequency as appropriate to the unit chosen.

- Q. The display shall be programmed to read in inches of water column (in-wg) for an air handler application, pressure per square inch (psi) for a pump application, and temperature (°F) for a cooling tower application.
- R. VFD shall be able to be programmed to sense the loss of load and signal a no load/broken belt warning or fault.
- S. If the temperature of the VFD's heat sink rises to 80°C, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature. If the temperature of the heat sink continues to rise the VFD shall automatically reduce its output frequency to the motor. As the VFD's heat sink temperature returns to normal, the VFD shall automatically increase the output frequency to the motor and return the carrier frequency to it's normal switching speed.
- T. The VFD shall have temperature controlled cooling fans for quiet operation and minimized losses.
- U. The VFD shall store in memory the last 10 faults and related operational data.
- V. Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.
- W. Two programmable relay outputs, one Form C 240 V AC, one Form A 30 V AC, shall be provided for remote indication of VFD status.
- X. Three programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include two voltage (0 to 10 V DC, 2 to 10 V DC) and one current (0 to 20 mA, 4 to 20 mA) input.
- Y. Two programmable 0 to 20 mA analog outputs shall be provided for indication of VFD status. These outputs shall be programmable for output speed, frequency, current and power. They shall also be programmable to provide a selected 24 V DC status indication.
- Z. Under fire mode conditions, the VFD shall be able to be programmed to automatically default to a preset speed.

2.05 ADJUSTMENTS

- A. VFD shall have an adjustable carrier frequency in steps of not less than 0.1 kHz to allow tuning the VFD to the motor.
- B. Sixteen preset speeds shall be provided.
- C. Four acceleration and four deceleration ramps shall be provided. Accel and decel time shall be adjustable over the range from 0 to 3,600 seconds to base speed. The shape of these curves shall be automatically contoured to ensure no-trip acceleration and deceleration.

- D. Four current limit settings shall be provided.
- E. If the VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: under voltage, over voltage, current limit and inverter overload.
- F. The number of restart attempts shall be selectable from 0 through 20 or infinitely and the time between attempts shall be adjustable from 0 through 600 seconds.
- G. An automatic "on delay" may be selected from 0 to 120 seconds.

2.06 BYPASS

- A. Provide a manual 3-contactor bypass consisting of a door interlocked main fused disconnect padlockable in the off position, a built-in motor starter and a four position DRIVE/OFF/BYPASS/TEST switch controlling three contactors. In the DRIVE position, the motor is operated at an adjustable speed from the VFD. In the OFF position, the motor and VFD are disconnected. In the BYPASS position, the motor is operated at full speed from the AC power line and power is disconnected from the VFD so that service can be performed. In the TEST position, the motor is operated at full speed from the AC line power while power is applied to the input of the VFD. This allows the VFD to be given an operational test while continuing to run the motor at full speed in bypass. In case of an external safety fault, a customer supplied normally closed dry contact shall be able to stop the motor whether in DRIVE or BYPASS mode.
- B. Service personnel shall be able to defeat the main power disconnect and open the bypass enclosure without disconnecting power. This shall be accomplished through the use of a specially designed tool and mechanism while meeting all local and national code requirements for safety.

2.07 SERVICE

CONDITIONS

- A. Ambient temperature, -10 to 40°C (14 to 104°F).
- B. 0 to 95% relative humidity, non-condensing.
- C. Elevation to 3,300 feet without derating.
- D. AC line voltage variation, -10 to +10% of nominal with full output.
- E. No side clearance shall be required for cooling of any units. All power and control wiring shall be done from the bottom.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surface is suitable for controller installation.
- B. Do not install controller until building environment can be maintained within the service conditions required by the manufacturer.

- C. Verify that field measurements are as indicated on shop drawings and as instructed by manufacturer.

3.02 INSTALLATION

- A. Section 01400 - Quality Control: Manufacturer's instructions.
- B. Install in accordance with NEMA ICS 3.1.
- C. Tighten accessible connections and mechanical fasteners after placing controller.
- D. Provide fuses in fusible switches; refer to Section 16477 for product requirements.
- E. Select and install overload heater elements in motor controllers to match installed motor characteristics.
- F. Provide engraved plastic nameplates; refer to Section 16195 for product requirements and location.
- G. Neatly type label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place in clear plastic holder.

3.03 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.16.2.

3.04 MANUFACTURER'S FIELD SERVICES

- A. The manufacturer shall provide start-up commissioning of the VFD and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. Sales personnel and other agents who are not factory certified shall not be acceptable as commissioning agents. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options and its interface wiring to the building automation system.

3.05 ADJUSTING

- A. Division 1 - Contract Closeout.
- B. Make final adjustments to installed controller to assure proper operation of load system. Obtain performance requirements from installer of driven loads.

3.06 DEMONSTRATION AND INSTRUCTIONS

- A. Division 1 - Contract Closeout:
- B. Demonstrate operation of controllers in automatic and manual modes. Furnish 2 (1) one hour training sessions on the project site with the owner, by factory authorized personal.

END OF SECTION

SECTION 23 31 13
METAL DUCTS

PART 1 - GENERAL

SECTION 233113 - METAL DUCTS

PART 2 - PRODUCTS

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Double-wall rectangular ducts and fittings.
3. Single-wall round and flat-oval ducts and fittings.
4. Double-wall round and flat-oval ducts and fittings.
5. Sheet metal materials.
6. Duct liner.
7. Sealants and gaskets.
8. Hangers and supports.
9. Seismic-restraint devices.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment.
13. Seismic restraints, where applicable
14. Vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

2.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
 - a. Luminaires.
 - b. Air outlets and inlets.

- c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.
- B. Welding certificates.
- C. Field quality-control reports.

2.6 QUALITY ASSURANCE

- A. **Welding Qualifications:** Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. **Welding Qualifications:** Qualify procedures and personnel according to the following:
- 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."
- D. Construct ductwork to NFPA 90A and NFPA 90B standards. All work, materials and equipment shall comply with the latest requirements of NFPA 90A, standards and the local authorities having jurisdiction.
- E. All ductwork and fan and apparatus plenums constructed and having supported in accordance with the latest standards of the ASHRAE Guide and the Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
- F. Bracing, gauges, and supports indicated in SMACNA manuals are the minimum acceptable. Additional bracing or supports shall be installed to eliminate any distortion or vibration when the systems are operating or under tests.

PART 3 - EXECUTION

3.1 General

- A. General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.
- B. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz per sq ft for each side in conformance with ASTM A90.
- C. Dissimilar Metals: Separate connections between dissimilar metals with Dielectric Insulation. Joints between dissimilar metal duct sections to be made with Companion flanges separated by a Neoprene gasket.

- D. Fasteners: Rivets, bolts, screens, and other hardware used in the sheet metal construction to be constructed of materials identical or similar to the duct material to prevent galvanic corrosion.
- E. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic as manufactured by 3M Company EC-800.
- F. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

3.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.3 DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. Provide products from one of the following manufactures
 - 1. McGill Airflow LLC
 - 2. Zen Industries
 - 3. Lindab
 - 4. Spiral Manufacturing Co. Inc
- B. Rectangular Ducts: Fabricate ducts with indicated dimensions for the inner duct.
- C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- D. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-

support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- E. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- F. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard." For standard applications
 - 1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - 2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
 - 3. Coat insulation with antimicrobial coating.
 - 4. Cover insulation with polyester film complying with UL 181, Class 1.
- G. Interstitial Insulation: Flexible elastomeric duct liner complying with ASTM C 534, Type II for sheet materials, and with NFPA 90A or NFPA 90B. For Humid and damp area application
 - 1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
- H. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch-diameter perforations, with overall open area of 23 percent.
- I. Formed-on Transverse Joints (Flanges): Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- J. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Provide products from one of the following manufactures
 - 1. McGill Airflow LLC
 - 2. Zen Industries

3. Lindab
 4. Spiral Manufacturing Co. Inc
- C. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- D. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- E. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- F. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.5 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. Provide products from one of the following manufactures
1. McGill Airflow LLC
 2. Zen Industries
 3. Lindab
 4. Spiral Manufacturing Co. Inc
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.
- C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.
1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved,

duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- a. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 - b. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch-diameter perforations, with overall open area of 23 percent.
- E. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
 3. Coat insulation with antimicrobial coating.
 4. Cover insulation with polyester film complying with UL 181, Class 1.
- F. Interstitial Insulation: Flexible elastomeric duct liner complying with ASTM C 534, Type II for sheet materials, and with NFPA 90A or NFPA 90B. for application in damp or humid environments
 1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

3.6 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. PVC-Coated, Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G90.
 2. Minimum Thickness for Factory-Applied PVC Coating: 4 mils thick on sheet metal surface of ducts and fittings exposed to corrosive conditions, and minimum 1 mil thick on opposite surface.
 3. Coating Materials: Acceptable to authorities having jurisdiction for use on ducts listed and labeled by an NRTL for compliance with UL 181, Class 1.
- D. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- E. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- F. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- G. Factory- or Shop-Applied Antimicrobial Coating:
1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
 2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
 4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
 5. Shop-Applied Coating Color: **[Black]** **[White]**.
 6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.
- H. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- I. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

3.7 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

- a. Maximum Thermal Conductivity:
 - 1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - 2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Solvent Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
- B. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.
 1. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
 2. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
- C. Insulation Pins and Washers:
 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel, aluminum, or stainless steel to match ductwork; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- D. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 3. Butt transverse joints without gaps, and coat joint with adhesive.
 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
 6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
 7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
 8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

- a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

3.8 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 2. Tape Width: 4 inches.
 3. Sealant: Modified styrene acrylic.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 7. Service: Indoor and outdoor.
 8. Service Temperature: Minus 40 to plus 200 deg F.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
- C. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
 2. Solids Content: Minimum 65 percent.
 3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Solvent-Based Joint and Seam Sealant:
1. Application Method: Brush on.
 2. Base: Synthetic rubber resin.
 3. Solvent: Toluene and heptane.
 4. Solids Content: Minimum 60 percent.

5. Shore A Hardness: Minimum 60.
 6. Water resistant.
 7. Mold and mildew resistant.
 8. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
 9. Service: Indoor or outdoor.
 10. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- E. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.
- F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- G. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

3.9 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

3.10 SEISMIC-RESTRAINT DEVICES

- A. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of the ICC Evaluation Service or an agency acceptable to authorities having jurisdiction.
 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- B. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- C. Restraint Cables: ASTM A 603, galvanized or ASTM A 492, stainless-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- D. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped to hanger rod.
- E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 4 - EXECUTION

4.1 DUCT INSTALLATION

- A. *Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.*
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths and with fewest possible joints
- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections. *Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 0 degrees divergence upstream of equipment and 45 degrees convergence downstream.*

- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 2 inch, plus allowance for insulation thickness and with sufficient space around equipment to allow normal operating and maintenance activities. *Provide easements where ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.*
- H. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for all installations as well as fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."
- M. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- N. Where hanger rods must pierce ducts, provide closure plates around rods and fasten to duct using screws, rivets or welding. Seal with sealing compound.
- O. *Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.*

4.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

4.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

- A. No 16 USSG black steel.
- B. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.
- C. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Cleanout doors on horizontal duct shall be mounted on side of duct. Bottom edge shall be not less than 2 inch above bottom of duct. Cleanout doors at vertical ducts shall be mounted at base. Door and frame shall be same gauge as duct. Hinges shall be Ventlock No. 260, extra heavy zinc plated. Latches shall be Ventlock No. 140, cast zinc. Gaskets shall be between door and frame. Gaskets shall be 1/8 inch double thickness rated for 2000 degree F. Cleanout door size shall be 24 inch one side, and other side shall be 2 inch less than duct height.
- D. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.
- E. All seams, joints and penetrations shall be liquid tight continuous external arc welded, except where the duct stub collar of the hood is connected to the exhaust duct. Connection to the hood shall be continuous liquid tight external arc welded or in accordance with the NFPA 96, 1984.
- F. Angle reinforcing shall be minimum 1 1/2 inch X 1 1/2 inch X 3/16 inch at maximum 4 ft. on centers and in accordance with SMACNA Rectangular Industrial Duct Contraction Standards shall be mounted.

4.4 ADDITIONAL INSTALLATION REQUIREMENTS FOR LAUNDRY EXHAUST DUCTWORK (NOT USED)

- A. All clothes dryers shall be exhausted in accordance with manufacturer instructions.
- B. Fire, smoke, combination dampers or other similar devices that will obstruct flow are prohibited in the exhaust system.
- C. Provide cleanouts at the base of each vertical section and riser.
- D. Ducts shall not be connected or installed with sheet metal screws or other fasteners that protrude more than 1/8" into the inside of the duct.

- E. All exhaust fans shall be listed and labeled to UL 705 and installed in accordance with the manufacturer's instructions. Fan motors shall be outside of the airstream and operate continuously. (provide standby power)
- F. All duct elbows must be radius elbows, square elbows and/or turning vanes are not permitted.
- G. Each riser shall be an independent system of exhaust fan, pressure sensor, motor controller and associated wiring, supports and specialties.
- H. Refer to floor plans for riser offsets as noted; provide cleanouts at all vertical sections.
- I. Provide sub-duct for each dryer connection. Re: mechanical equipment notes for make and model. Install in accordance with manufacturer instructions.
- J. Exhaust riser shall be installed in a shaft constructed and fire-resistance rated as required by code; re: architectural plans for shaft construction.

4.5 DUCT SEALING

- A. Seal ducts at a minimum to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Outdoor, Supply-Air Ducts: Seal Class A.
 - 3. Outdoor, Exhaust Ducts: Seal Class C.
 - 4. Outdoor, Return-Air Ducts: Seal Class C.
 - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 - 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
 - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
 - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
 - 9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
 - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 12. Conditioned Space, Return-Air Ducts: Seal Class C.

4.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- G. Where hanger rods must pierce ducts, provide closure plates around rods and fasten to duct using screws, rivets or welding. Seal with sealing compound

4.7 SEISMIC-RESTRAINT-DEVICE INSTALLATION (NOT USED)

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems." ASCE/SEI 7.
1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 2. Brace a change of direction longer than 12 feet.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an evaluation service member of the ICC Evaluation Service or an agency acceptable to authorities having jurisdiction.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during

- drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

4.8 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.
- C. **Smoke purge supply and exhaust systems and stair pressure systems. Flexible connection shall be permitted at diffusers, a maximum of 3' long, and flexible connections are permitted at air handling equipment for vibration isolation only.**
- D. **INSULATED FLEXIBLE DUCTS**
 1. UL 181, Class 0, interlocking spiral of aluminum foil; fiberglass insulation; polyethylene vapor barrier film.
 2. Pressure Rating: 8 inches WG positive or negative.
 3. Maximum Velocity: 5000 fpm
 4. Temperature Range: -20 degrees F to 250 degrees F.

4.9 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

4.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 2. Test the following systems:

- a. All Ducts with a Pressure Class equal to or Higher Than 2-Inch wg: Test representative duct sections totaling no less than 25 percent of total installed duct area for each system of the designated pressure class.
 - b. All smoke purge system Ducts, including supply exhaust and return air. All stair pressurization ductwork. Test representative duct sections totaling no less than 50 percent of total installed duct area of each system.
 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 4. Test for leaks before applying external insulation.
 5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
 6. Give seven days' advance notice for testing.
- C. Duct System Cleanliness Tests:
1. Visually inspect duct system to ensure that no visible contaminants are present.
 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

4.11 DUCT CLEANING

- A. Clean new existing duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

4.12 SMOKE AND HEAT DETECTOR INSTALLATION

- A. Duct mounted smoke and heat detectors will be supplied under the Electrical Division. This Contractor to coordinate duct sizes and provide labor to install sensing probes into ductwork.

4.13 DUCTWORK PROTECTION

- A. Duct work under construction or alteration shall not be left open ended during dust producing construction. All new and existing ductwork systems in the area of alteration or under construction shall be protected during construction. Open ends ducts shall be sealed with sheet metal or as approved.
- B. For unenclosed buildings ductwork shall be kept dry and water tight. Seal open ends water tight during construction to prevent water infiltration. Keep all acoustical lining dry during

construction. Lining that has become we shall be replaced. all incomplete ductwork being used to condition spaces in phase I or phase II that will be completed under a later phase must be protect from being internally contaminated by construction dust. All returns opening must have filters placed over then to prevent dust from being returned to the unit.

4.14 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

- Underground Ducts: Concrete-encased, PVC-coated, galvanized sheet steel with thicker coating on duct exterior, stainless steel, fiberglass

B. Duct Pressure class;

- All duct systems shall be constructed to have a pressure classification based on the maximum static pressure (positive or negative) developed by the air handling apparatus connected to the ductwork system. Unless otherwise noted below, refer to the equipment schedules and equipment notes for the design operating pressure of each system. Systems with operating pressures between pressure classes shall be constructed to the next higher pressure class.

Pressure Classification Table						
System operating pressure (OP) in wc	OP≤1"	1"≥OP<2"	2"≥OP<3"	3"≥OP<4"	4"≥OP<6"	6"≥OP<10"
SMACNA Construction classification	1"	2"	3"	4"	6"	10"

- All ductwork shall be constructed in accordance with the leakage and seal classification. Note that the leakage and seal classification required by current code is more stringent than SMACNA requirements.

leakage and Seal Classification Table					
System operating pressure in wc		≤2" low	2">med<3"		High≥3"
Seal Class		C	B		A
Sealing		Transverse joints	Transverse joints and seams		Transverse joints and seams and all wall penetrations
Leakage class CL factor		24	12		4

C. Supply Ducts:

- Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, unit ventilators and Terminal Units: (supply, return, OA intake)

- a. Pressure Class: Positive 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 24.
 2. Ducts Connected to Constant-Volume Air-Handling Units and packaged roof top units: (supply, return, OA intake)
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
- D. Exhaust Ducts:
1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
 2. Ducts Connected to Commercial **Kitchen Hoods**: Comply with NFPA 96.
 - a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
 - b. Concealed: Type 304, stainless-steel sheet, No. 2D finish or Carbon-steel sheet.
 - c. Welded seams and joints.
 - d. Pressure Class: Positive or negative 2-inch wg.
 - e. Airtight/Watertight.
 3. Ducts Connected to **Dishwasher Hoods: (NOT USED)**
 - a. Type 304, stainless-steel sheet.
 - b. Exposed to View: No. 4 Insert finish
 - c. Concealed: No. 2D finish. Or aluminum
 - d. Welded seams and flanged joints with watertight EPDM gaskets.
 - e. Pressure Class: Positive or negative 2-inch wg.
 - f. Airtight/Watertight.
- E. Intermediate Reinforcement:
1. Galvanized-Steel Ducts: Galvanized steel.
 2. PVC-Coated Ducts:
 - a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.
 3. Stainless-Steel Ducts:
 - a. Exposed to Airstream: Match duct material.

- b. Not Exposed to Airstream: Match duct material.
 - 4. Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.
- F. Liner for sound attenuation:
- 1. Supply Air Ducts: Flexible elastomeric, 1 inch thick.
 - 2. Return Air Ducts: Flexible elastomeric, 1 inch thick.
 - 3. ALL FAN COIL UNIT CABINETS: Flexible elastomeric, 1 1/2 inch thick.
 - 4. Supply Fan Plenums: Flexible elastomeric, 1 inch thick.
 - 5. Return- and Exhaust-Fan Plenums: Flexible elastomeric, 1 inches thick.
- G. Elbow Configuration:
- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with turning vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with turning vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - 2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with turning vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - 3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

- a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - 4) Radius-to Diameter Ratio: 1.5.
- b. Round Elbows, 12 Inches and Smaller in Diameter:
- c. Round Elbows, 14 Inches and Larger in Diameter:

H. Branch Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
- 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Barometric relief dampers.
3. Manual volume dampers.
4. Control dampers.
5. Fire dampers.
6. Ceiling radiation dampers.
7. Smoke dampers.
8. Combination fire and smoke dampers.
9. Corridor dampers.
10. Flange connectors.
11. Turning vanes.
12. Remote damper operators.
13. Duct-mounted access doors.
14. Flexible connectors.
15. Duct security bars.
16. Duct accessory hardware.

B. Related Requirements:

1. Section 233113 Metal Ducts
2. Section 233346 "Flexible Ducts" for insulated and non-insulated flexible ducts.
3. Section 233723 "HVAC Gravity Ventilators" for roof-mounted ventilator caps.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Control-damper installations.
 - d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
 - e. Duct security bars.
 - f. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.
- B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.
- C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Greenheck Fan Corporation.
 - 2. Nailor Industries Inc.
 - 3. Pottorff.
 - 4. Ruskin Company.
 - 5. Buckley
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 1000 fpm.
- D. Maximum System Pressure: up to 6"wc.
- E. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel 0.03-inch-thick stainless steel 0.05-inch-thick stainless steel, with welded corners or mechanically attached and mounting flange.
- F. Blades: Multiple single-piece blades, center pivoted, or off-center pivoted, maximum 6-inch width, 0.025-inch-thick, roll-formed aluminum or 0.050-inch-thick aluminum sheet noncombustible, tear-resistant, neoprene-coated fiberglass with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Neoprene, mechanically locked.
- I. Blade Axles:

1. Material: Galvanized, steel Stainless steel, or Aluminum.
 2. Diameter: 0.20 inch min.
- J. Tie Bars and Brackets: Aluminum or Galvanized steel.
- K. Return Spring: Adjustable tension.
- L. Bearings: Steel ball or synthetic pivot bushings.
- M. Accessories:
1. Adjustment device to permit setting for varying differential static pressure.
 2. Counterweights and spring-assist kits for vertical airflow installations.
 3. Electric actuators.
 4. Chain pulls.
 5. Screen Mounting: Front mounted in sleeve.
 - a. Sleeve Thickness: 20 gage minimum.
 - b. Sleeve Length: 6 inches minimum.
 6. Screen Mounting: Rear mounted.
 7. Screen Material: Galvanized steel or Aluminum.
 8. Screen Type: Bird. ½ x ½ max opening
 9. 90-degree stops.

2.4 BAROMETRIC RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck Fan Corporation.
 2. Nailor Industries Inc.
 3. Pottorff.
 4. Ruskin Company.
 5. Buckley
- B. Suitable for horizontal or vertical mounting.
- C. Maximum Air Velocity: 1000 fpm.
- D. Maximum System Pressure: upto 6-inch wg.
- E. Frame: Hat-shaped, 0.05-inch-thick, galvanized sheet steel 0.094-inch-thick, galvanized sheet steel 0.063-inch-thick extruded aluminum 0.03-inch-thick stainless steel 0.05-inch-thick stainless steel, with welded corners or mechanically attached and mounting flange.
- F. Blades:
1. Multiple, 0.025-inch-thick, roll-formed aluminum or 0.050-inch-thick aluminum sheet.
 2. Maximum Width: 6 inches.
 3. Action: Parallel.

4. Balance: Gravity.
 5. Eccentrically pivoted or Off-center pivoted.
- G. Blade Seals: Neoprene.
- H. Blade Axles: Galvanized steel, aluminum, or Stainless steel.
- I. Tie Bars and Brackets:
1. Material: Aluminum or Galvanized steel.
 2. Rattle free with 90-degree stop.
- J. Return Spring: Adjustable tension.
- K. Bearings: Synthetic, Stainless steel, Bronze.
- L. Accessories:
1. Flange on intake.
 2. Adjustment device to permit setting for varying differential static pressures.

2.5 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flex-Tek Group.
 - b. McGill AirFlow LLC.
 - c. Nailor Industries Inc.
 - d. Pottorff.
 - e. Ruskin Company.
 - f. Vent Products Co., Inc.
 - g. Buckley
 2. Standard leakage rating, with linkage outside airstream.
 3. Suitable for horizontal or vertical applications.
 4. Frames:
 - a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel or 0.05-inch-thick stainless steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.

- d. Galvanized or Stainless-steel, 0.064 inch thick.
 - 6. Blade Axles: Galvanized steel, Stainless or steel Nonferrous metal.
 - 7. Bearings:
 - a. Oil-impregnated bronze, Molded synthetic, Oil-impregnated stainless-steel sleeve.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 8. Tie Bars and Brackets: Galvanized steel.
- B. Standard, Aluminum, Manual Volume Dampers:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McGill AirFlow LLC.
 - b. Nailor Industries Inc.
 - c. Pottorff.
 - d. Ruskin Company.
 - e. Vent Products Co., Inc.
 - 2. Standard leakage rating, with linkage outside airstream.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames: Hat-shaped, 0.10-inch-thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
 - 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Roll-Formed Aluminum Blades: 0.10-inch-thick aluminum sheet.
 - e. Extruded-Aluminum Blades: 0.050-inch-thick extruded aluminum.
 - 6. Blade Axles: Galvanized steel or Stainless steel.
 - 7. Bearings:
 - a. Oil-impregnated bronze, Molded synthetic, or Stainless-steel sleeve.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 8. Tie Bars and Brackets: Aluminum.
- C. Low-Leakage, Steel, Manual Volume Dampers:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McGill AirFlow LLC.
 - b. Nailor Industries Inc.

- c. Pottorff.
- d. Ruskin Company.
- e. Vent Products Co., Inc.
- 2. Comply with AMCA 500-D testing for damper rating.
- 3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
- 4. Suitable for horizontal or vertical applications.
- 5. Frames:
 - a. U or Angle shaped.
 - b. 0.094-inch-thick, galvanized sheet steel or 0.05-inch-thick stainless steel.
 - c. Mitered and welded corners.
 - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
- 6. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized or Stainless, roll-formed steel, 0.064 inch thick.
- 7. Blade Axles: Galvanized steel or Stainless steel.
- 8. Bearings:
 - a. Oil-impregnated bronze, Molded synthetic, Oil-impregnated stainless-steel sleeve, Stainless-steel sleeve.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 9. Blade Seals: Neoprene.
- 10. Jamb Seals: Cambered stainless steel or aluminum.
- 11. Tie Bars and Brackets: Galvanized steel or Aluminum.
- 12. Accessories:
 - a. Include locking device to hold single-blade dampers in a fixed position without vibration.

D. Low-Leakage, Aluminum, Manual Volume Dampers:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McGill AirFlow LLC.
 - b. Nailor Industries Inc.
 - c. Pottorff.
 - d. Ruskin Company.
 - e. Vent Products Co., Inc.
- 2. Comply with AMCA 500-D testing for damper rating.

3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
4. Suitable for horizontal or vertical applications.
5. Frames: U or Angle-shaped, 0.10-inch-thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
6. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Roll-Formed Aluminum Blades: 0.10-inch-thick aluminum sheet.
 - d. Extruded-Aluminum Blades: 0.050-inch-thick extruded aluminum.
7. Blade Axles: Galvanized steel, Stainless steel.
8. Bearings:
 - a. Oil-impregnated bronze, Molded synthetic, Oil-impregnated stainless-steel sleeve, Stainless-steel sleeve.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
9. Blade Seals: Neoprene.
10. Jamb Seals: Cambered stainless steel, aluminum.
11. Tie Bars and Brackets: Galvanized steel, Aluminum.
12. Accessories:
 - a. Include locking device to hold single-blade dampers in a fixed position without vibration.

E. Jackshaft:

1. Size: 0.5-inch diameter min.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

F. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.6 CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Arrow United Industries.
 2. Greenheck Fan Corporation.

3. McGill AirFlow LLC.
4. Nailor Industries Inc.
5. Pottorff.
6. Ruskin Company.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

1. U or Angle shaped.
2. 0.094-inch-thick, galvanized sheet steel or 0.05-inch-thick stainless steel.
3. Mitered and welded corners.

D. Blades:

1. Multiple blade with maximum blade width of 6 inches.
2. Parallel blade for non modulating application
3. Opposed-blade design for all modulating applications
4. Galvanized-steel, Stainless steel, Aluminum.
5. 0.064 inch thick single skin or 0.0747-inch-thick dual skin.
6. Blade Edging: Closed-cell neoprene.
7. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

E. Blade Axles: 1/2-inch-diameter; galvanized steel, or stainless steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

F. Bearings:

1. Oil-impregnated bronze, Molded synthetic, Oil-impregnated, stainless-steel sleeve, or Stainless-steel sleeve.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.7 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arrow United Industries.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.
4. Pottorff.
5. Ruskin Company.
6. Ward Industries; a brand of Hart & Cooley, Inc.

B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.

- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
- D. Fire Rating: 1-1/2 and 3 hours.
- E. Frame: Curtain type with blades inside airstream for application in duct over 24" in height. Curtain type with blades outside airstream for ducts 24" or less in height. Multiple-blade type; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 - 1. Minimum Thickness: 0.138 inch upto 4 SF 0.39 over 4 SF inch thick, as indicated, and of length to suit application.
 - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- G. Mounting Orientation: Vertical or horizontal as indicated.
- H. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.
- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, 165 deg F [**212 deg F**] rated, fusible links.

2.8 CEILING RADIATION DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Aire Technologies.
 - 2. Nailor Industries Inc.
 - 3. Pottorff.
 - 4. Prefco.
 - 5. Ruskin Company.
- B. General Requirements:
 - 1. Labeled according to UL 555C by an NRTL.
 - 2. Comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."
- C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.
- D. Blades: Galvanized sheet steel with refractory insulation.
- E. Heat-Responsive Device: Replaceable, 165 deg F [**212 deg F**] rated, fusible links.
- F. Fire Rating: 1hr for applications in assemblies up to 1 ½ hr rating. 2hr for application in assemblies of up to 3hr

2.9 SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck Fan Corporation.
 2. Nailor Industries Inc.
 3. Pottorff.
 4. Ruskin Company.
- B. General Requirements: Label according to UL 555S by an NRTL.
- C. Smoke Detector: Integral, factory wired for single-point connection. Except for NYC smoke detector shall be provided by the fire alarm contractor.
- D. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded or mechanically attached corners and mounting flange.
- E. Blades: Roll-formed, horizontal, overlapping, 0.063-inch- thick, galvanized sheet steel.
- F. Leakage: Class I.
- G. Rated pressure and velocity to exceed design airflow conditions.
- H. Mounting Sleeve: Factory-installed, 0.05-inch- thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.
- I. Damper Motors: Modulating or two-position action.
- J. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
 6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
 7. Electrical Connection: **[115 V, single phase, 60 Hz]** <Insert values>.

K. Accessories:

1. Auxiliary switches for signaling, fan control and position indication.
2. Test and reset switches, damper or remote mounted.
3. Manual damper testing by physically depressing the low temperature thermal disc from the inside of the damper sleeve and resetting the sensor from the exterior side of the damper sleeve.
4. Dual position blade indicator switch package shall connect directly to the blade axel for positive annunciation (interconnecting arms, wire-forms, or brackets shall not be accepted) and provide full open and full closed blade indication to a remote location.
5. Dual Position Indicator Switch Package: Shall connect directly to the blade axel for positive annunciation (interconnecting arms, wire-forms, or brackets shall not be accepted) and provide full open and full closed blade indication to a remote location.
6. Duct Smoke Detector: Factory mounted in the damper sleeve with interconnecting wiring from the damper actuator to the smoke detector enabling a single power connection point for easy field wiring.

2.10 COMBINATION FIRE AND SMOKE DAMPERS (**NOT USED**)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck Fan Corporation.
 2. Pottorff.
 3. Ruskin Company.
- B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
- D. Fire Rating: 1-1/2 for assemblies upto 2 hour and 3 hr rating for assemblies over 1 1/2hours.
- E. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded corners and mounting flange.
- F. Primary heat responsive device set at 285 deg F, resettable.
- G. Secondary heat closure device, set at 350 deg F, resettable.
- H. Smoke Detector: Integral, factory wired for single-point connection.
- I. Blades: Roll-formed, horizontal, interlocking, 0.063-inch- thick, galvanized sheet steel.
- J. Leakage: Class I.
- K. Rated pressure and velocity to exceed design airflow conditions.
- L. Mounting Sleeve: Factory-installed, 0.039-inch- thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone caulking.
- M. Master control panel for use in dynamic smoke-management systems.

- N. Damper Motors: Modulating or two-position action.
- O. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
 - 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 - 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 - 5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
 - 6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
 - 7. **Electrical Connection: 115 V, single phase, 60 Hz.**
- P. Accessories:
 - A. DRS-30 Two-Temperature Fire Closure Device:
 - 1. UL classified two-temperature device permits the damper to be re-opened after initial temperature closure allowing the damper to remain operable for smoke management purposes until the high temperature limit is reached.
 - 2. Manual damper testing is permitted by physically depressing the low temperature thermal disc from the inside of the damper sleeve and resetting the sensor from the exterior side of the damper sleeve.
 - 3. Dual position blade indicator switch package shall connect directly to the blade axel for positive annunciation (interconnecting arms, wire-forms, or brackets shall not be accepted) and provide full open and full closed blade indication to a remote location.
 - B. PI-50 Dual Position Indicator Switch Package: Shall connect directly to the blade axel for positive annunciation (interconnecting arms, wire-forms, or brackets shall not be accepted) and provide full open and full closed blade indication to a remote location.
 - C. Duct Smoke Detector: Factory mounted in the damper sleeve with interconnecting wiring from the damper actuator to the smoke detector enabling a single power connection point for easy field wiring.

2.11 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Hardcast, Inc.
4. Ward Industries; a brand of Hart & Cooley, Inc.

- B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

2.12 DUCT SILENCERS (NOT USED)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Industrial Noise Control, Inc.
 2. McGill AirFlow LLC.
 3. Ruskin Company.
 4. Vibro-Acoustics.
 5. Industrial Acoustics
- B. General Requirements:
1. Factory fabricated.
 2. Fire-Performance Characteristics: Adhesives, sealants, packing materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84.
 3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- C. Shape:
1. Rectangular straight with splitters or baffles.
 2. Round straight with center bodies or pods.
 3. Rectangular elbow with splitters or baffles.
 4. Round elbow with center bodies or pods.
 5. Rectangular transitional with splitters or baffles.
- D. Rectangular Silencer Outer Casing: ASTM A 653/A 653M, G90 , galvanized sheet steel, 0.040 inch thick.
- E. Round Silencer Outer Casing: ASTM A 653/A 653M, G90, galvanized sheet steel.
1. Sheet Metal Thickness for Units up to 24 Inches in Diameter: 0.034 inch thick.
 2. Sheet Metal Thickness for Units 26 through 40 Inches in Diameter: 0.040 inch thick.
 3. Sheet Metal Thickness for Units 42 through 52 Inches in Diameter: 0.05 inch thick.
 4. Sheet Metal Thickness for Units 54 through 60 Inches in Diameter: 0.064 inch thick.

- F. Inner Casing and Baffles: ASTM A 653/A 653M, G60 galvanized sheet metal, 0.034 inch thick, and with 1/8-inch-diameter perforations.
- G. Special Construction:
 - 1. Suitable for outdoor use.
 - 2. High transmission loss to achieve STC 45.
- H. Connection Sizes: Match connecting ductwork unless otherwise indicated.
- I. Principal Sound-Absorbing Mechanism:
 - 1. Controlled impedance membranes and broadly tuned resonators without absorptive media.
 - 2. Dissipative or Film-lined type with fill material.
 - a. Fill Material: Inert and vermin-proof fibrous material, packed under not less than 15 percent compression and Moisture-proof nonfibrous material.
 - b. Erosion Barrier: Polymer bag enclosing fill, and heat sealed before assembly.
 - 3. Lining: Fiberglas cloth.
- J. Fabricate silencers to form rigid units that will not pulsate, vibrate, rattle, or otherwise react to system pressure variations. Do not use mechanical fasteners for unit assemblies.
 - 1. Joints: Lock formed and sealed or continuously welded or flanged connections.
 - 2. Suspended Units: Factory-installed suspension hooks or lugs attached to frame in quantities and spaced to prevent deflection or distortion.
 - 3. Reinforcement: Cross or trapeze angles for rigid suspension.
- K. Accessories:
 - 1. Integral 1-1/2 3-hour fire damper with access door. Access door to be high transmission loss to match silencer.
 - 2. Factory-installed end caps to prevent contamination during shipping.
 - 3. Removable splitters.
 - 4. Airflow measuring devices.
- L. Source Quality Control: Test according to ASTM E 477.
 - 1. Testing to be witnessed by Engineer.
 - 2. Record acoustic ratings, including dynamic insertion loss and generated-noise power levels with an airflow of at least 2000-fpm face velocity.
 - 3. Leak Test: Test units for airtightness at 200 percent of associated fan static pressure or 6-inch wg static pressure, whichever is greater.
- M. Capacities and Characteristics:
 - 1. Configuration: Straight or 90-degree elbow as indicated on plan
 - 2. Shape: Rectangular or Round as indicated on plan
 - 3. Attenuation Mechanism: Acoustical glass fiber with protective film liner.

4. Maximum Pressure Drop: 0.25-inch wg.
5. Casing:
 - a. Attenuation: Standard.
 - b. Outer Material: Galvanized steel.
 - c. Inner Material: Galvanized steel.
6. Velocity Range: 500 fpm max.
7. End Connection: 1-inch slip joint or Flange.
8. Length: as per plan
9. Face Dimension:
 - a. Width: as per plan
 - b. Height: as per plan
10. Face Velocity: as per plan
11. Dynamic Insertion Loss: as per plan
12. Generated Noise: as per plan
13. Accessories:
 - a. Access door.
 - b. Birdscreen.

2.13 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Aero-Dyne Sound Control Co.
 2. CL WARD & Family Inc.
 3. Ductmate Industries, Inc.
 4. Duro Dyne Inc.
 5. METALAIRE, Inc.
 6. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- E. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.14 REMOTE DAMPER OPERATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Pottorff.
 - 2. Ventfabrics, Inc.
 - 3. Young Regulator Company.
- B. Description: Cable system designed for remote manual damper adjustment.
- C. Tubing: Copper or Aluminum.
- D. Cable: Steel.
- E. Wall-Box Mounting: Recessed.
- F. Wall-Box Cover-Plate Material: Stainless steel.

2.15 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CL WARD & Family Inc.
 - 2. Ductmate Industries, Inc.
 - 3. Greenheck Fan Corporation.
 - 4. McGill AirFlow LLC.
 - 5. Nailor Industries Inc.
 - 6. Pottorff.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
 - 1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inchbutt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 - 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles for plenum applications.

- d. Access Doors Larger Than 24 by 48 Inches: Four hinges or Continuous and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

- 1. Door and Frame Material: Galvanized sheet steel.
- 2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
- 3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
- 4. Factory set at 3.0- to 8.0-inch wg.
- 5. Doors close when pressures are within set-point range.
- 6. Hinge: Continuous piano.
- 7. Latches: Cam.
- 8. Seal: Neoprene or foam rubber.
- 9. Insulation Fill: 1-inch-thick, fibrous-glass or polystyrene-foam board.

2.16 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3M.
 - 2. Ductmate Industries, Inc.
 - 3. Flame Gard, Inc.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.
- D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.17 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CL WARD & Family Inc.
 - 2. Ductmate Industries, Inc.
 - 3. Duro Dyne Inc.
 - 4. Elgen Manufacturing.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.

- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches or 5-3/4 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd..
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 - 1. Minimum Weight: 24 oz./sq. yd..
 - 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
 - 3. Service Temperature: Minus 50 to plus 250 deg F.
- G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.
 - 1. Minimum Weight: 16 oz./sq. yd..
 - 2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
 - 3. Service Temperature: Minus 67 to plus 500 deg F.
- H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.
 - 1. Minimum Weight: 14 oz./sq. yd..
 - 2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
 - 3. Service Temperature: Minus 67 to plus 500 deg F.
- I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
 - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 - 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 - 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.18 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Compliance with ASHRAE/IESNA 90.1-2004 includes Section 6.4.3.3.3 - "Shutoff Damper Controls," restricts the use of backdraft dampers, and requires control dampers for certain applications. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
 - 3. Install stainless steel volume dampers in stainless steel ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Install duct security bars. Construct duct security bars from 0.164-inch steel sleeve, continuously welded at all joints and 1/2-inch-diameter steel bars, 6 inches o.c. in each direction in center of sleeve. Weld each bar to steel sleeve and each crossing bar. Weld 2-1/2-by-2-1/2-by-1/4-inch steel angle to 4 sides and both ends of sleeve. Connect duct security bars to ducts with flexible connections. Provide 12-by-12-inch hinged access panel with cam lock in duct in each side of sleeve.
- I. Connect ducts to duct silencers rigidly.

- J. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Upstream from duct filters.
 - 3. At outdoor-air intakes and mixed-air plenums.
 - 4. At drain pans and seals.
 - 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 7. At each change in direction and at maximum 50-foot spacing and the bottom of all riser in Laundry exhaust ducts.
 - 8. Upstream from turning vanes.
 - 9. Upstream or downstream from duct silencers.
 - 10. Control devices requiring inspection.
 - 11. Elsewhere as indicated.
- K. Install access doors with swing against duct static pressure.
- L. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.
 - 6. Body plus Ladder Access: 25 by 17 inches.
- M. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- N. Install flexible connectors to connect ducts to equipment.
- O. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- P. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- Q. Connect diffusers or light troffer boots to ducts with maximum 30-inch lengths of flexible duct clamped or strapped in place.
- R. Connect flexible ducts to metal ducts with draw bands.
- S. Install duct test holes where required for testing and balancing purposes.

- T. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Utility set fans.
 - 2. Centrifugal roof ventilators.
 - 3. Axial roof ventilators.
 - 4. Upblast propeller roof exhaust fans.
 - 5. Centrifugal wall ventilators.
 - 6. Ceiling-mounted ventilators.
 - 7. In-line centrifugal fans.
 - 8. Propeller fans.
 - 9. laboratory exhaust fans
 - 10. Kitchen exhaust fans

1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on sea level.
- B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material thickness and finishes, including color charts.
 - 5. Dampers, including housings, linkages, and operators.
 - 6. Roof curbs.
 - 7. Fan speed controllers.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.

- C. Delegated-Design Submittal: For unit hangars and supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
 - 2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
- D. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Roof framing and support members relative to duct penetrations.
 - 2. Ceiling suspension assembly members.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- E. Field quality-control reports.
- F. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
- C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.6 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.
- C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Belts: 2 set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.1 UTILITY SET FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carnes Company.
 - 2. Loren Cook Company.
 - 3. New York Blower Company
 - 4. PennBarry.
 - 5. Greenheck.
- B. Housing: Fabricated of galvanized steel with side sheets fastened with a deep lock seam or welded to scroll sheets.
 - 1. Housing Discharge Arrangement: Adjustable to eight standard positions.
- C. Fan Wheels: Single-width, single inlet; welded to cast-iron or cast-steel hub and spun-steel inlet cone, with hub keyed to shaft.
 - 1. Blade Materials: Aluminum.
 - 2. Blade Type: Backward inclined or Forward curved Airfoil. As scheduled
 - 3. Spark-Resistant Construction: AMCA 99, Type A.
- D. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
- E. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L₅₀ of 200,000 hours.
 - 1. Extend grease fitting to accessible location outside of unit.
- F. Belt Drives:
 - 1. Factory mounted, with final alignment and belt adjustment made after installation
 - 2. Service Factor Based on Fan Motor Size: 1.5.
 - 3. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
 - 4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
 - 5. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.
- G. Accessories:
 - 1. Inlet and Outlet: Flanged.
 - 2. Companion Flanges: Rolled flanges for duct connections of same material as housing.
 - 3. Backdraft Dampers: Gravity actuated with counterweight and interlocking aluminum blades with felt edges in steel frame installed on fan discharge.
 - 4. Access Door: Gasketed door in scroll with latch-type handles.
 - 5. Scroll Dampers: Single-blade damper installed at fan scroll top with adjustable linkage.
 - 6. Inlet Screens: Removable wire mesh.
 - 7. Drain Connections: NPS 3/4 threaded coupling drain connection installed at lowest point of housing.
 - 8. Weather Hoods: Weather resistant with stamped vents over motor and drive compartment.

9. Discharge Dampers: Assembly with opposed blades constructed of two plates formed around and to shaft, channel frame, sealed ball bearings, with blades linked outside of airstream to single control lever of same material as housing.
10. Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
11. Disconnect switch - Nonfusible type, with thermal-overload protection

2.2 CENTRIFUGAL ROOF VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Carnes Company.
 2. Central Blower Company.
 3. Greenheck Fan Corporation.
 4. Loren Cook Company.
 5. PennBarry.
- B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.
 1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector (for kitchen hood exhaust).
 2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.
- C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- D. Belt Drives:
 1. Resiliently mounted to housing.
 2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
 5. Fan and motor isolated from exhaust airstream.
- E. Accessories:
 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside or outside fan housing, factory wired through an internal aluminum conduit.
 3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
 4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
 5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.
- F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
 1. Configuration: Self-flashing without a cant strip, with mounting flange.
 2. Overall Height: 12 inches.
 3. Sound Curb: Curb with sound-absorbing insulation.
 4. Pitch Mounting: Manufacture curb for roof slope.

5. Metal Liner: Galvanized steel.
6. Burglar Bars: 1/2-inch- thick steel bars welded in place to form 6-inch squares. (Not required unless scheduled)
7. Mounting Pedestal: Galvanized steel with removable access panel.
8. Vented Curb: Unlined with louvered vents in vertical sides.

2.3 AXIAL ROOF VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carnes Company.
 2. Greenheck Fan Corporation.
 3. Hartzell Fan Incorporated.
 4. Loren Cook Company.
 5. New York Blower Company
 6. PennBarry.
- B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; square, one-piece, hinged, aluminum base.
1. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.
- C. Fan Wheel: Aluminum or Steel hub and blades.
- D. Belt Drives:
1. Resiliently mounted to housing.
 2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
- E. Accessories:
1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside or outside fan housing, factory wired through an internal aluminum conduit.
 2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
 3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
 4. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.
- F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
1. Configuration: Self-flashing without a cant strip, with mounting flange.
 2. Overall Height: 12 inches.
 3. Sound Curb: Curb with sound-absorbing insulation.
 4. Pitch Mounting: Manufacture curb for roof slope.
 5. Metal Liner: Galvanized steel.
 6. Burglar Bars: 1/2-inch- thick steel bars welded in place to form 6-inch squares.(required where specifically scheduled)
 7. Mounting Pedestal: Galvanized steel with removable access panel.

2.4 UPBLAST PROPELLER ROOF EXHAUST FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carnes Company.
 - 2. Greenheck Fan Corporation.
 - 3. Hartzell Fan Incorporated.
 - 4. Loren Cook Company.
 - 5. New York Blower Company (The).
 - 6. PennBarry.
- B. Wind Band, Fan Housing, and Base: Reinforced and braced galvanized steel or aluminum, containing galvanized-steel or aluminum butterfly dampers and rain trough, motor and drive assembly, and fan wheel.
 - 1. Damper Rods: Steel with bronze bearings.
 - 2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.
- C. Fan Wheel: Replaceable, extruded-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.
- D. Belt Drives:
 - 1. Resiliently mounted to housing.
 - 2. Weatherproof housing of same material as fan housing.
 - 3. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 4. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings.
 - 5. Pulleys: Cast-iron, adjustable-pitch motor pulley.
 - 6. Motor Mount: On outside of fan cabinet, adjustable base for belt tensioning.
- E. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
 - 1. Configuration: Self-flashing without a cant strip, with mounting flange.
 - 2. Overall Height: 12 inches.
 - 3. Sound Curb: Curb with sound-absorbing insulation.
 - 4. Pitch Mounting: Manufacture curb for roof slope.
 - 5. Metal Liner: Galvanized steel.
 - 6. Burglar Bars: 1/2-inch- thick steel bars welded in place to form 6-inch squares.(required only where specifically scheduled)
 - 7. Mounting Pedestal: Galvanized steel with removable access panel.
 - 8.
- F. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside or outside fan housing, factory wired through an internal aluminum conduit.
- G. Kitchen hood exhaust fans shall be UL 555 rated. They shall be equipped with a grease collection cup and drain tube. Fans shall be hard ducted without flexible connection or back draft dampers. Fans shall hinged for access and cleaning with out being dismantled.

2.5 CENTRIFUGAL WALL VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carnes Company.
 - 2. Greenheck Fan Corporation.
 - 3. Hartzell Fan Incorporated.
 - 4. Loren Cook Company.
 - 5. PennBarry.
- B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; venturi inlet cone.
- C. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.
- D. Belt Drives:
 - 1. Resiliently mounted to housing.
 - 2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 - 4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
 - 5. Fan and motor isolated from exhaust airstream.
- E. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through internal aluminum conduit.
 - 3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
 - 4. Wall Grille: Ring type for flush mounting.
 - 5. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in wall sleeve; factory set to close when fan stops.
 - 6. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

2.6 CEILING-MOUNTED VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carnes Company.
 - 2. Greenheck Fan Corporation.
 - 3. Loren Cook Company.
 - 4. PennBarry.
- B. Housing: Steel, lined with acoustical insulation.
- C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
- D. Grille: Aluminum or Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

- E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- F. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
 - 3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
 - 4. Motion Sensor: Motion detector with adjustable shutoff timer.
 - 5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
 - 6. Filter: Washable aluminum to fit between fan and grille.
 - 7. Isolation: Rubber-in-shear vibration isolators.
 - 8. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.7 IN-LINE CENTRIFUGAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carnes Company.
 - 2. Greenheck Fan Corporation.
 - 3. Hartzell Fan Incorporated.
 - 4. Loren Cook Company.
 - 5. PennBarry.
- B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
- F. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent. (where scheduled or indicated on plan)
 - 2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
 - 3. Companion Flanges: For inlet and outlet duct connections.
 - 4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
 - 5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
 - 6. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside or outside fan housing, factory wired through an internal aluminum conduit

2.8 PROPELLER FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carnes Company.
 - 2. Chicago Blower Corporation.
 - 3. Loren Cook Company.
 - 4. New York Blower Company (The).
 - 5. PennBarry.
- B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.
- C. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.
- D. Fan Wheel: Replaceable, cast or extruded-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.
- E. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- F. Fan Drive:
 - 1. Resiliently mounted to housing.
 - 2. Statically and dynamically balanced.
 - 3. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
 - 4. Extend grease fitting to accessible location outside of unit.
 - 5. Service Factor Based on Fan Motor Size: 1.4.
 - 6. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 7. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 - a. Ball-Bearing Rating Life: ABMA 9, L_{10} of 100,000 hours.
 - 8. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
 - 9. Motor Pulleys: Adjustable pitch for use with motors through 3 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
 - 10. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
 - 11. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.
- G. Accessories:
 - 1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
 - 2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
 - 3. Wall Sleeve: Galvanized steel to match fan and accessory size.
 - 4. Weathershield Hood: Galvanized steel to match fan and accessory size.
 - 5. Weathershield Front Guard: Galvanized steel with expanded metal screen.
 - 6. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 7. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

2.9 LABORATORY EXHAUST FANS (Not Used)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck.
 2. Loren Cook Company.
 3. New York Blower Company.
 4. PennBarry.
- B. GENERAL
1. Base fan performance at standard conditions (density 0.075 Lb/ft³).
 2. Fans selected shall be capable of accommodating static pressure and flow variations of +/-15% of scheduled values.
 3. Each fan shall be belt driven.
 4. Fans to be equipped with lifting lugs.
 5. Fan to be coated steel with a minimum of 4 mils of Hi-Pro Polyester Resin. Color to be gray.
 6. Fasteners to be stainless steel.
 7. Fan assembly shall be designed for a minimum of 125 MPH wind loading, without the use of guy wires.
- C. CORROSION RESISTANT COATING
1. All fan and system components (fan, nozzle, wind band, plenum) shall be corrosion resistant coated with a two part electrostatically applied and baked, sustainable, corrosion resistant coating system; or Heresite P-413C. Standard finish color to be gray.
 2. All parts shall be cleaned and chemically prepared for coating using a multi-stage wash system which includes acid pickling that removes oxide, increases surface area, and improves coating bond to the substrate.
 3. The first powder coat applied over the prepared surface shall be a zinc rich epoxy primer (no less than 70% zinc) and heated to a gelatinous consistency (partial cure) at which the second powder coat of polyester resin shall be electrostatically applied and simultaneously be cured at a uniform temperature of 400°F.
 4. The coating system shall not be less than a total thickness of 6 mils, is not affected by the UV component of sunlight (does not chalk), and has superior corrosion resistance to acid, alkali, and solvents. Coating system shall exceed 4000 hour ASTM B117 Salt Spray Resistance.
 5. Note that 10-20 mil thick wet coating systems pollute the environment (air and water), and that these manually applied coatings are not uniform over the impeller surface and can cause fan imbalance and vibration.
- D. FAN HOUSING AND OUTLET
1. Fan housing to be aerodynamically designed with high-efficiency inlet, engineered to reduce incoming air turbulence.
 2. Fan housing shall be welded steel with a minimum of 4 mils of Hi-Pro Polyester Resin. No uncoated metal fan parts shall be acceptable.
 3. Fan housings that are fabricated of polypropylene or fiberglass that have lower mechanical properties than steel, have rough interior surfaces in which corrosive, hazardous compounds can collect, and / or which chalk and structurally degrade due to the UV component of the sunlight shall not be acceptable.

4. A high velocity conical discharge nozzle shall be supplied by the fan manufacturer and be designed to efficiently handle an outlet velocity of up to 6000 FPM. Discharge stack caps or hinged covers, impeding exhaust flow shall not be permitted.
5. Provide housing drain for removal of rain and condensation.
6. A bolted and gasketed access door shall be supplied in the fan housing allowing for impeller inspection or removal of impeller, shaft and bearings without removal of the fan housing.
7. Standard finish color to be gray.

E. FAN IMPELLER

1. Fan impeller shall be centrifugal, backward inclined, with non-stall characteristics. The impeller shall be electronically balanced both statically and dynamically per AMCA Standard 204.
2. Fan impeller shall be manufactured of aluminum (AMCA type B spark resistant), fully welded and meet specification section 2.15 for corrosion resistant coating.

F. FAN BYPASS AIR PLENUM

1. For constant volume systems, the fan shall be connected directly to the exhaust duct without the need of a bypass air plenum.
2. For variable volume systems, a bypass air plenum shall be provided as shown on drawings. The plenum shall be equipped with a bypass air damper and intake air hood with bird screen for introducing outside air at roof level upstream of the fan.
3. The plenum shall be constructed of fully welded steel, meet specification section 2.15 for corrosion resistant coating, and mount on roof curb as shown on the project drawings. Plenums that are fabricated of plastics or resins that are combustible and have mechanical properties less than steel shall not be acceptable.
4. The bypass air plenum shall be mounted on factory fabricated roof curb provided by the fan manufacturer, as shown on the project drawings.
5. Fan designs that use inlet flexible connectors that can leak causing loss of lab exhaust shall not be accepted.
6. Bypass air dampers shall be opposed-blade design, and coated with a minimum of 4 mils of Hi-Pro Polyester resin, electrostatically applied and baked.
7. A fan isolation damper, either gravity back draft or two position actuated, fabricated of steel or aluminum and coated with minimum 4 mils of Hi-Pro Polyester resin, electrostatically applied and baked, shall be provided as shown on the project documents.
8. Blower / Plenum vibration isolation shall be limited to neoprene / cork vibration pads.

G. BYPASS AIR PLENUM CURB

1. Exhaust system manufacturer shall supply a structural support curb for the plenum, of specified height, as shown on the drawings.
2. Curb shall be fabricated of a minimum of 12 gauge corrosion resistant coated steel and structurally reinforced.
3. Curbs shall be insulated.
4. When properly anchored to the roof structure, the standard curb / plenum / blower assembly shall withstand wind loads of up to 125 mph without additional structural support.

H. FAN MOTORS AND DRIVE

1. Motors to be premium efficiency, standard NEMA frame, TEFC with a 1.15 service factor. A factory mounted NEMA 3R disconnect switch shall be provided for each fan. Motor maintenance shall be accomplished without fan impeller removal or requiring maintenance personnel to access the contaminated exhaust components.
2. Drive belts and sheaves shall be sized for 200% of the motor horsepower, and shall be readily and easily accessible for service, if required. Drive shall consist of a minimum of two belts under all circumstances.
3. Shaft to be polished and ground steel.
4. Fan shaft bearings shall be Air Handling Quality, ball or roller pillow block type and be sized for an L-10 life of no less than 100,000 hours. Bearings shall be fixed to the fan shaft using concentric mounting locking collars, which reduce vibration, increase service life, and improve serviceability. Bearings that use set screws shall not be allowed.
5. All shaft bearings shall have extended lube lines with zerkl fittings

I. MOTORS

1. Default motor characteristics are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 15 Section "Common Motor Requirements for HVAC Equipment."
3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

J. Enclosure Type: Totally enclosed, fan cooled.

2.10 KITCHEN HOOD EXHAUST FANS

A. Type - belt drive roof up-blast centrifugal fans

B. General Description:

1. Discharge air up and away from the mounting surface.
2. Upblast fan shall be for roof mounted applications.
3. Maximum continuous operating temperature is 400 Fahrenheit
4. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number.

C. Wheel:

1. Material type: aluminum Non -stick coating
2. Non-overloading, backward inclined centrifugal
3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
4. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency

D. Motors:

1. Motor enclosures: Totally enclosed fan cooled
2. Motors are heavy duty ball bearing type to match with the fan load and furnished at the specific voltage and phase.
3. Mounted on vibration isolators, out of the airstream
4. For motor cooling there shall be fresh air drawn into the motor compartment through an area free of discharge contaminants.

5. Accessible for maintenance

E. Shafts and Bearings:

1. Fan shaft shall be ground and polished solid steel with an anti corrosive coating
2. Permanently sealed bearings or pillow block ball bearings
3. Bearing shall be selected for a minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed
4. Bearings are 100 percent factory tested
5. Fan Shaft first critical speed is at least 25 percent over maximum operating speed

F. Housing:

1. Constructed of heavy gauge aluminum includes exterior housing, curb cap, windband, and motor compartment housing. Galvanized material is not acceptable.
2. Housing shall have a rigid internal support structure.
3. Windband to be one piece uniquely spun aluminum construction and maintain original material thickness throughout the housing.
4. Windband to include an integral rolled bead for strength.
5. Curb cap base to be fully welded to windband to ensure a leak proof construction. Tack welding, bolting, and caulking are not acceptable.
6. Curb cap to have integral deep spun inlet venturi and pre-punched mounting holes to ensure correct attachment to curb.
7. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators.
8. Breather tube shall be 10 square inches in size for fresh air motor cooling, and designed to allow wiring to be run through it.

G. Vibration Isolation:

1. Double studded or pedestal style true isolators
2. No metal to metal contact
3. Sized to match the weight of each fan

H. Disconnect Switches:

1. NEMA rated: 3R
2. Positive electrical shut-off
3. Wired from fan motor to junction box installed within motor compartment

I. Drive Assembly

1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower
2. Belts: Static free and oil resistant
3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts
4. The motor pulley shall be adjustable for final system balancing
5. Readily accessible for maintenance

J. Drain Trough:

1. Allows for one-point drainage of water, grease, and other residues

K. Options/Accessories:

1. Auto Belt Tensioner:

- a. Automatic tensioning device that adjusts for the correct belt tension, only for single drives.
2. Birdscreen:
 - a. Material Type: Aluminum
 - b. Protects fan discharge
 3. Clean Out Port:

- a. Removable grease repellent compression rubber plug allows access for cleaning wheel through windband.
- 4. Curb Extension:
 - a. Type: GPE
 - b. Material Type: Aluminum OR Galvanized
 - c. Coating: Baked Enamel
- 5. Curb Seal:
 - a. Rubber seal between the fan and the roof curb
- 6. Drain Connection:
 - a. Constructed of aluminum
- b. Allows single-point drainage of grease, water, or other residues
 - 7. Finishes:
 - a. Types: Baked Enamel
 - 8. Grease Trap:
 - a. Constructed of aluminum
 - b. Includes drain connection
 - c. Collects grease residue
 - d. Optional with grease absorbent sock
- 9. Hinge Kit:
 - a. Aluminum hinges
- b. Allows the fan to tilt away for access to wheel and ductwork for inspection and cleaning.
 - 10. Hinge Base:
 - a. Aluminum hinges
 - b. Hinges and restraint cables are mounted to a base (sleeve)
- c. Allows the fan to tilt away for access to wheel and ductwork for inspection and cleaning.
 - 11. Heat Baffle:
 - a. 1 inch thick insulation shield that prevents heat from radiating into the motor compartment.
 - 12. Roof Curbs:
 - a. Types: Welded, straight side curb with vents and 5 inch flashing flange, and wood nailer.
 - b. Mounted onto roof with fan
 - c. Material: Aluminum or Galvanized
 - d. Insulation thickness: 2 inches
 - e. Coating Type: Baked Enamel
 - 13. Tie-Down Points:

2.11 Four brackets located on windband secures fan in heavy wind applications

2.12 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Support units using spring isolators or restrained spring isolators for projects with seismic requirements having a static deflection of 1 inch. Vibration- and seismic-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
 - 1. Secure vibration and seismic controls to concrete bases using anchor bolts cast in concrete base.
- C. Install floor-mounted units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- D. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- E. Support suspended units from structure using threaded steel rods and elastomeric hangers or spring hangers with vertical-limit stops having a static deflection of 1 inch. Vibration-control devices are specified in Division 15 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- F. Install units with clearances for service and maintenance.
- G. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section "Air Duct Accessories."
- B. Kitchen exhaust hood fans shall not have flexible connections or back draft dampers.
- C. Install ducts adjacent to power ventilators to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 1. Verify that shipping, blocking, and bracing are removed.
 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 3. Verify that cleaning and adjusting are complete.
 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 5. Adjust belt tension.
 6. Adjust damper linkages for proper damper operation.
 7. Verify lubrication for bearings and other moving parts.
 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 10. Shut unit down and reconnect automatic temperature-control operators.
 11. Remove and replace malfunctioning units and retest as specified above.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Comply with requirements in "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
 - D. Mechanical schedules and equipment notes indicate estimated static pressures and resultant RPM. If, during balancing, it is determined that the sheaves supplied with fan or air handling unit have reached the maximum adjustment and design static pressure and or CFM can not be obtained then it shall be the mechanical contractors responsibility to remove and change the drive as required to reach design conditions. And it shall be the balancers responsibility to rebalance the system as appropriate to achieve design conditions after the drives have been changed.
- D. Lubricate bearings.

END OF SECTION

SECTION 234100

PARTICULATE AIR FILTRATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal panel filters.
 - 2. Flat panel filters.
 - 3. Pleated panel filters.
 - 4. Ring panel filters.
 - 5. Nonsupported bag filters.
 - 6. Supported bag filters.
 - 7. Rigid cell box filters.
 - 8. V-bank cell filters.
 - 9. Self-supported pocket filters.
 - 10. Automatic roll filters.
 - 11. Bulk media.
 - 12. Front- and rear-access filter frames.
 - 13. Side-service housings.
 - 14. Filter gages.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include dimensions; operating characteristics; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.
- B. Shop Drawings: For air filters. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show filter rack assembly, dimensions, materials, and methods of assembly of components.
 - 2. Include setting drawings, templates, and requirements for installing anchor bolts and anchorages.
 - 3. Include diagram for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of filter and rack to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Provide extra filters of each type, for the owners stock.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. ASHRAE Compliance:
 - 1. Comply with applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality"; Section 5 - "Systems and Equipment"; and Section 7 - "Construction and Startup."
 - 2. Comply with ASHRAE 52.2 for MERV for methods of testing and rating air-filter units.
- B. Comply with NFPA 90A and NFPA 90B.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 METAL PANEL FILTERS

- A. Description: Factory-fabricated, self-supported, cleanable, all-metal, impingement-type, panel-type, permanent air filters with holding frames.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AAF International.
 - b. Airguard.
 - c. Camfil Farr.
 - d. Flanders Corporation.
 - e. Purafil, Inc.
- B. Media: Four or Six alternate layers of aluminum or stainless-steel flat and herringbone-crimp screen.
 - 1. Nonoiled for grease removal application.
 - 2. Adhesive coating.

- C. Filter-Media Frame: Aluminum or Stainless steel, hinged, and with pull and retaining handles fastened to the media.
 - 1. Drain holes.
- D. Capacities and Characteristics: RE; Plans

2.3 FLAT PANEL FILTERS

- A. Description: Factory-fabricated, self-supported, flat, nonpleated, panel-type, disposable air filters with holding frames.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M.
 - b. AAF International.
 - c. Airguard.
 - d. Camfil Farr.
 - e. Flanders Corporation.
 - f. Purafil, Inc.
- B. Filter Unit Class: UL 900, Class 1 or Class 2 in accordance with system requirements.
- C. Media: Interlaced glass or synthetic fibers coated with nonflammable adhesive.
 - 1. Media shall be coated with an antimicrobial agent.
 - 2. Metal Retainer: Upstream side and downstream side.
- D. Filter-Media Frame: Cardboard with perforated metal retainer sealed or bonded to the media.
- E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.
- F. Capacities and Characteristics: RE; plans
 - 1. MERV Rating: 6 when tested according to ASHRAE 52.2.

2.4 PLEATED PANEL FILTERS

- A. Description: Factory-fabricated, self-supported, extended-surface, pleated, panel-type, disposable air filters with holding frames.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M.
 - b. AAF International.
 - c. Airguard.
 - d. Camfil Farr.
 - e. Flanders Corporation.
 - f. Purafil, Inc.
- B. Filter Unit Class: UL 900, Class 1.
- C. Media: Interlaced glass or synthetic fibers coated with nonflammable adhesive.

1. Media shall be coated with an antimicrobial agent.
 2. Separators shall be bonded to the media to maintain pleat configuration.
 3. Welded-wire grid shall be on downstream side to maintain pleat.
 4. Media shall be bonded to frame to prevent air bypass.
 5. Support members on upstream and downstream sides to maintain pleat spacing.
- D. Filter-Media Frame: Cardboard frame with perforated metal retainer or Galvanized steel Aluminized steel with metal grid on outlet side and steel rod grid on inlet side, hinged, with pull and retaining handles sealed or bonded to the media.
- E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.
- F. Capacities and Characteristics: RE; Plans
1. MERV Rating: 7, 11, 13, 14 as per plan when tested according to ASHRAE 52.2.

2.5 RING PANEL FILTERS

- A. Description: Internally supported, flat panel filters for installation in a filter track.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AAF International.
 - b. Airguard.
 - c. Camfil Farr.
 - d. Flanders Corporation.
 - e. Purafil, Inc.
- B. Filter Unit Class: UL 900, Class 1.or Class 2 in accordance with system requirements.
- C. Media: Two, Three, or Four-ply polyester with sealed edges.
1. Panel Construction: Single with one edge unsealed for support removal Linked.
 2. Media shall be coated with an antimicrobial agent.
- D. Internal Support: 9-gage steel-wire frame.
- E. Capacities and Characteristics:RE Plans

2.6 NONSUPPORTED BAG FILTERS

- A. Description: Factory-fabricated, dry, extended-surface, nonsupported filters with header frames.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AAF International.
 - b. Airguard.
 - c. Camfil Farr.
 - d. Purafil, Inc.
- B. Filter Unit Class: UL 900, Class 1 or Class 2 in accordance with system requirements.

- C. Media: Glass-fiber, Synthetic material constructed so individual pockets are maintained in tapered form under rated-airflow conditions by flexible internal supports.
 - 1. Media shall be coated with an antimicrobial agent.
- D. Filter-Media Frame: Galvanized steel, or Hard polyurethane foam.
- E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.
- F. Capacities and Characteristics: RE Plans
 - 1. MERV Rating: 8, 10, 12, or 15, as per plans when tested according to ASHRAE 52.2.

2.7 SUPPORTED BAG FILTERS

- A. Description: Factory-fabricated, dry, extended-surface, self-supported filters with holding frames in steel, basket-type retainers.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AAF International.
 - b. Airguard.
 - c. Camfil Farr.
 - d. Flanders Corporation.
 - e. Purafil, Inc.
- B. Filter Unit Class: UL 900, Class 1 or Class 2 in accordance with system requirements.
- C. Media: Fibrous material constructed so individual pleats are maintained in tapered form under rated-airflow conditions by flexible internal supports.
 - 1. Media shall be coated with an antimicrobial agent.
- D. Filter-Media Frame: Galvanized steel or Hard polyurethane foam.
- E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.
- F. Capacities and Characteristics: RE Plans
 - 1. MERV Rating: 6, 8, or 13 as per plan, when tested according to ASHRAE 52.2.

2.8 RIGID CELL BOX FILTERS

- A. Description: Factory-fabricated, adhesive-coated, disposable, packaged air filters with media perpendicular to airflow, and with holding frames.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AAF International.
 - b. Airguard.
 - c. Camfil Farr.
 - d. Flanders Corporation.
 - e. Koch Filter Corporation.

f. Purafil, Inc.

- B. Filter Unit Class: UL 900, Class 1.or Class 2 in accordance with system requirements.
- C. Media: Fibrous material constructed so individual pleats are maintained in tapered form under rated-airflow conditions by flexible internal supports.
 - 1. Media shall be coated with an antimicrobial agent.
- D. Filter-Media Frames: Galvanized steel or Hard polyurethane foam.
- E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.
- F. Capacities and Characteristics:RE Plans
 - 1. MERV Rating: 6, 8, or 13 as per plan Insert number when tested according to ASHRAE 52.2.

2.9 V-BANK CELL FILTERS

- A. Description: Factory-fabricated, adhesive-coated, disposable, packaged air filters with media angled to airflow, and with holding frames.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AAF International.
 - b. Airguard.
 - c. Camfil Farr.
 - d. Flanders Corporation.
 - e. Purafil, Inc.
- B. Filter Unit Class: UL 900, Class 1.or Class 2 in accordance with system requirements.
- C. Media: Fibrous material constructed so individual pleats are maintained in tapered form under rated-airflow conditions by flexible internal supports.
 - 1. Media shall be coated with an antimicrobial agent.
- D. Filter-Media Frames: Galvanized steel Hard polyurethane foam.
- E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.
- F. Capacities and Characteristics: as per plan
 - 1. MERV Rating: 6, 8, 13 as per plan when tested according to ASHRAE 52.2.

2.10 SELF-SUPPORTED POCKET FILTERS

- A. Description: Factory-fabricated, panel-type, disposable air filters with contoured media for extended surface.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M.

- b. AAF International.
 - c. Airguard.
 - d. Flanders Corporation.
- B. Filter Unit Class: UL 900, Class 1 or Class 2 in accordance with system requirements.
- C. Media: Fibrous material constructed so individual pleats are maintained in tapered form under rated-airflow conditions by flexible internal supports.
 - 1. Media shall be coated with an antimicrobial agent.
- D. Configuration: Single-pocket cube or Multipocket.
- E. Filter-Media Frame: Galvanized steel or Hard polyurethane foam.
- F. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.
- G. Capacities and Characteristics: RE plans
 - 1. MERV Rating: 6, 8, or 13 as per plans when tested according to ASHRAE 52.2.

2.11 FRONT- AND REAR-ACCESS FILTER FRAMES

- A. Framing System: Galvanized-steel or Aluminum framing members with access for either upstream (front) or downstream (rear) filter servicing, cut to size and prepunched for assembly into modules. Vertically support filters to prevent deflection of horizontal members without interfering with either filter installation or operation.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AAF International.
 - b. Airguard.
 - c. Camfil Farr.
 - d. Flanders Corporation.
 - e. Purafil, Inc.
- B. Prefilters: Incorporate a separate track with spring clips, removable from front or back.
- C. Sealing: Factory-installed, positive-sealing device for each row of filters, to ensure seal between gasketed filter elements and to prevent bypass of unfiltered air.

2.12 SIDE-SERVICE HOUSINGS

- A. Description: Factory-assembled, side-service housings, constructed of galvanized steel or aluminum, with flanges to connect to duct or casing system.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AAF International.
 - b. Airguard.
 - c. Camfil Farr.
 - d. Flanders Corporation.

e. Purafil, Inc.

- B. Prefilters: Integral tracks to accommodate 2-inch- deep, disposable filters.
- C. Access Doors: Hinged, with continuous gaskets on perimeter and positive-locking devices, and arranged so filter cartridges can be loaded from either access door.
- D. Sealing: Incorporate positive-sealing gasket material on channels to seal top and bottom of filter cartridge frames and to prevent bypass of unfiltered air.

2.13 FILTER GAGES

- A. Diaphragm-type gage with dial and pointer in metal case, vent valves, black figures on white background, and front recalibration adjustment.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AirGuard; Clarcor Air Filtration Products, Inc.
 - b. Dwyer Instruments, Inc.
 - 2. Diameter: 4-1/2 inches.
 - 3. Scale Range for Filter Media Having a Recommended Final Resistance of 3.0- to 4.0-Inch wg or Less: 0- to 4.0-inch wg.
- B. Manometer-Type Filter Gage: Molded plastic, with epoxy-coated aluminum scale and logarithmic-curve tube gage with integral leveling gage, graduated to read from 0- to 3.0-inch wg, and accurate within 3 percent of the full-scale range.
- C. Accessories: Static-pressure tips, tubing, gage connections, and mounting bracket.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Equipment Mounting:
 - 1. Install filter assemblies on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete." Section 033053 "Miscellaneous Cast-in-Place Concrete."
 - 2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."
- B. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.
- C. Install filters in position to prevent passage of unfiltered air.
- D. Install filter gage for each filter bank.
- E. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing with new, clean filters.

- F. Install filter-gage, static-pressure taps upstream and downstream from filters. Install filter gages on filter banks with separate static-pressure taps upstream and downstream from filters. Mount filter gages on outside of filter housing or filter plenum in an accessible position. Adjust and level inclined gages.
- G. Coordinate filter installations with duct and air-handling-unit installations.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections:
 - 1. Test for leakage of unfiltered air while system is operating.
- D. Air filter will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.3 CLEANING

- A. After completing system installation and testing, adjusting, and balancing of air-handling and air-distribution systems, clean filter housings and install new filter media.

END OF SECTION 234100

SECTION 236423.21
AIR COOLED MODULAR CHILLERS / SPLIT SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. Work Included: The air-cooled modular split chiller system shall consist of individual chiller modules that are assembled on site. Each chiller module shall be completely factory wired, and tested prior to shipment. Each module shall include a compressor, evaporator, and controls plus a remote outdoor air-cooled condenser. Controls shall be designed on a distributed master control system that allows the master microprocessor to operate remaining slave modules in the event of a malfunction of any slave controller. The controls shall also be designed to allow each individual slave microprocessor to operate on its own temperature sensor if there is a failure of the master microprocessor.

1.3 QUALITY ASSURANCE

- A. Unit shall be constructed in accordance with the UL 1995 and NEC standards and be UL or ETL listed.
- B. Unit shall be rated and tested in accordance with ARI 550/590 – Standard for Water Chilling Packages.
- C. Unit shall meet the safety standards of ANSI/ASHRAE 15 – Safety Standard for Refrigerated Systems.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include refrigerant, rated capacities, operating characteristics, and furnished specialties and accessories.
 - 2. Performance at AHRI standard conditions and at conditions indicated.
 - 3. Performance at AHRI standard unloading conditions.
 - 4. Minimum evaporator flow rate.
 - 5. Refrigerant capacity of water chiller.
 - 6. Oil capacity of water chiller.
 - 7. Fluid capacity of evaporator.

8. Characteristics of safety relief valves.
 9. Force and moment capacity of each piping connection.
- B. Shop Drawings: Complete set of manufacturer's prints of water chiller assemblies, control panels, sections and elevations, and unit isolation. Include the following:
1. Assembled unit dimensions.
 2. Weight and load distribution.
 3. Required clearances for maintenance and operation.
 4. Size and location of piping and wiring connections.
 5. Diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings:
1. Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - a. Structural supports.
 - b. Piping roughing-in requirements.
 - c. Wiring roughing-in requirements, including spaces reserved for electrical equipment.
 - d. Access requirements, including working clearances for mechanical controls and electrical equipment, and tube pull and service clearances.
 2. Coordination drawings showing plan, section and elevation views, drawn to 1/4"=1'-0" minimum.
 3. Each view to show screened background with the following:
 - a. Column grids, beams, columns, and concrete housekeeping pads.
 - b. Layout with walls, floors, and roofs, including each room name and number.
 - c. Equipment and products of other trades that are located in vicinity of chillers and part of final installation, such as plumbing systems.
- B. Certificates: For certification required in "Quality Assurance" Article.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each water chiller to include in emergency, operation, and maintenance manuals.
- B. Spare Parts List: Recommended spare parts list with quantity for each.
- C. Touchup Paint Description: Detailed description of paint used in application of finish coat to allow for procurement of a matching paint.
- D. Instructional Videos: Including those that are prerecorded and those that are recorded during training.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Tool kit to include the following:
 - 1. A tool kit specially designed by chiller manufacturer for use in servicing chiller(s) furnished.
 - 2. Special tools required to service chiller components not readily available to Owner service personnel in performing routine maintenance.
 - 3. Lockable case with hinged cover, marked with large and permanent text to indicate the special purpose of tool kit, such as "Chiller Tool Kit." Text size shall be at least 1 inch high.
 - 4. A list of each tool furnished. Permanently attach the list to underside of case cover. Text size shall be at least 1/2 inch high.
- B. Touchup Paint: 32 oz. container of paint used for finish coat. Label outside of container with detailed description of paint to allow for procurement of a matching paint in the future.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of water chillers that fail in materials or workmanship within specified warranty period.
 - 1. Extended warranties include, but are not limited to, the following:
 - a. Complete chiller including complete compressor and drive assembly.
 - 1) Loss of refrigerant charge for any reason due to manufacturer's product defect and product installation.
 - b. Parts only and labor.
 - 2. Warranty Period: ten years from date of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
- B. Protect units on site from physical damage after unloading.

PART 2 - PRODUCTS

2.1 CHILLER

- A. General: Each module shall be assembled on a powder coated, formed galvanized sheet metal frame and panels. The module shall be shipped individually and assembled on site. Each module

shall be fully charged with refrigerant and factory tested for capacity and controller functions prior to shipment. Chiller system must be built for single point power supply connection. The power distribution panel shall incorporate a circuit breaker for overload protection to each module. Electrical supply to each module shall consist of flexible conduit. No electrical connection to a module shall carry the load of more than that module. The electrical supply connections for each module shall be factory assembled and shipped with each module for field connection into the power distribution panel located on the tank and pump module. The maximum overcurrent protection for the chiller system should be sized to carry the load of current and future modules.

- B. Frame: Frame shall be constructed of white powder coated formed galvanized sheet metal.
- C. Cabinet: Epoxy coated aluminum panels mounted on welded steel frame. The cabinet enclosure shall be easily removable for servicing via stainless steel fasteners and retaining clips.
- D. Compressors: Hermetically sealed, scroll compressor on each refrigeration circuit each with rotalock connections, oil level sight glass, suction gas-cooled motor with solid-state sensors in the windings for overload protection, and circuit breaker protection. There shall be two independent compressors and refrigerant circuits per module. Compressors shall be mounted to the heavy gauge steel frame with rubber-in-shear vibration isolators
- E. Evaporators: Dual circuit, brazed plate evaporator on each module constructed of 316 stainless steel plates and copper brazing. The fluid connections to each evaporator shall use roll grooved couplings for service convenience and ease of installation. Each evaporator shall be insulated with ¾" closed cell insulation. The maximum working pressure shall be 650 psi. Evaporator piping fluid velocity shall not exceed 10 fps at any point in the system.
- F. Refrigerant Receiver: A refrigerant receiver shall be included on each refrigeration circuit for flooded condenser head pressure control is provided for low ambient operation. Each shall be sized to accommodate the required system pump down capacity. Chillers with receivers that do not provide full system pump down capacity as indicated are not acceptable. The receivers shall be provided with rotalock service valves for service isolation. A pressure relief valve rated at 600 psi shall be installed on the refrigerant receiver and piped to the outside of the chiller cabinet.
- G. Isolation Valves: Each evaporator and condenser branch line shall include a manual inlet and an electronic discharge butterfly valve that allows system flow to each active module to match the cooling requirements of the system. By isolating individual modules that are not operating, this allows the hydronic system to have variable primary flow. The chiller controls shall monitor the number of active chiller modules and provide the corresponding control signal to the pump microprocessor (if pumps are provided) to vary the secondary chiller pump speeds based on the number of active chiller modules. The valves shall be the slow opening type to minimize the sudden change in flow to the previously active modules. The valves shall have a minimum opening cycle time of 30 seconds between the fully closed and open position and shall have roll grooved connections. The condenser valves shall modulate open and closed to control refrigerant head pressure if the enter fluid temperature to the condenser falls below 65 F. The valves shall have a minimum close off pressure of not less than 75 psi and shall be rated for a maximum working pressure of 250 psi. The actuators shall be rated for 24 VAC.
- H. Filters: A 40-mesh industrial grade filter strainer shall be factory installed between the header system and each evaporator. The strainer shall be serviceable by isolation valves that permit each

strainer to be removed and cleaned without shutting down fluid flow or power to the entire system and allowing the remaining modules to continue to operate. In-line strainers that require complete system shutdown for service and isolation are not acceptable

- I. Liquid Piping: The fluid piping shall be Schedule 40 steel, and be insulated using closed cell pipe insulation to prevent condensation. The chiller shall have service valves for the independent isolation of each evaporator, without affecting the fluid flow to the remaining evaporators. Each chiller module shall connect to the adjacent module using Victaulic type roll grooved steel couplings and neoprene gaskets. Any type of module-to-module connection external to the modules is unacceptable.
- J. Refrigerant Piping: Refrigerant piping shall be Type K seamless copper, insulated with closed cell pipe insulation on the suction lines.
- K. Refrigerant Accessories: Each refrigerant circuit shall include compressor rotalock service valves, solenoid valves for compressor pumpdown, and Schrader service valves in the suction, discharge, and liquid lines, liquid line sight glass with moisture indicator and a filter dryer.
- L. Controls: The Master chiller module shall incorporate the Master microprocessor controller. The Master microprocessor shall communicate with the remaining Slave microprocessors in each module via a local network communications protocol. The master microprocessor shall include a phase monitor to protect against low voltage, phase unbalance, phase loss, and phase reversal conditions. The Master controller shall read all analog and fault port values from all Slave module controllers and shall pass these values to the Building Automation System via BACnet, Modbus or Lonworks protocols.
- M. Each chiller control system shall include operational switches for each compressor; high and low pressure transmitters to provide indication of refrigeration pressures in each circuit; high and low refrigeration pressure alarms including shutting shut down the responsible compressor(s); anti-short cycling compressor timers; minimum compressor run timers; connection to Building Automation System (if required).
- N. Microprocessor: The microprocessor shall provide the following minimum functions and alarms:
 - 1. Adjustable fluid temperature set point
 - 2. Multiple stage compressor control, including compressor rotation to provide even compressor usage and wear.
 - 3. High and low fluid temperature alarm set points
 - 4. Water inlet and outlet temperature
 - 5. Suction and discharge refrigeration pressures
 - 6. Suction and discharge refrigeration temperatures
 - 7. Compressor run status
 - 8. Current alarm status

9. Demand load
 10. Compressor run hours
 11. Alarm logging with minimum of previously 100 logged alarms with time and date of each occurrence
 12. Remote start stop input
 13. Dry contact for general alarm
 14. Number of compressor starts.
 15. Alarm history with retention of operational data before unit shutdown.
 16. Antirecycling timer status.
 17. Percent of maximum motor amperage.
 18. Current-limit set point.
- O. Interface Panel: An operator 7" touch screen interface panel with graphical display shall be installed on the master module to allow chiller operation monitoring, adjustment of user set points, and alarm monitoring.

2.2 INSULATION

- A. Closed-cell, flexible, elastomeric thermal insulation complying with ASTM C 534/C 534M, Type I for tubular materials and Type II for sheet materials.
1. Thickness: 1-1/2 inches.
- B. Adhesive: As recommended by insulation manufacturer.
- C. Factory-applied insulation over all cold surfaces of chiller capable of forming condensation. Components shall include, but not be limited to, evaporator, evaporator water boxes including nozzles, refrigerant suction pipe from evaporator to compressor, cold surfaces of compressor, refrigerant-cooled motor, and auxiliary piping.
1. Apply adhesive to 100 percent of insulation contact surface.
 2. Before insulating steel surfaces, prepare surfaces for paint, and prime and paint as indicated for other painted components. Do not insulate unpainted steel surfaces.
 3. Seal seams and joints to provide a vapor barrier.
 4. After adhesive has fully cured, paint exposed surfaces of insulation to match other painted parts.
 5. Manufacturer has option to factory or field insulate chiller components to reduce potential for damage during installation.
 6. Field-Applied Insulation:

- a. Components that are not factory insulated shall be field insulated to comply with requirements indicated.
- b. Manufacturer shall be responsible for chiller insulation whether factory or field installed to ensure that manufacturer is the single point of responsibility for chillers.
- c. Manufacturer's factory-authorized service representative shall instruct and supervise installation of field-applied insulation.
- d. After field-applied insulation is complete, paint insulation to match factory-applied finish.

2.3 ACCESSORIES

- A. Factory-furnished spring isolators for field installation.
 1. Spring Deflection: 1 inch.

2.4 CONDENSER MODULES

- A. General: The remote condenser shall be shipped complete with a nitrogen charge. Service valves with access ports allow for pressure testing and evacuation of field installed refrigeration piping. Each condenser shall have its own power supply to a non-fused disconnect switch.
- B. Fan Motors: The condenser fan motors shall 1140 RPM.
- C. Fan Blades: The blades shall be non-corrosive, durable injected composite plastic blades that are dynamically balanced and factory tested prior to shipping.
- D. Coils: Aluminum fins mechanically bonded to coppers tubes with integral subcooling circuits. Fin spacing shall not exceed 12 fins per inch. The coils shall be sized to provide full heat of rejection at jobsite elevation above sea level, at a maximum 25 degree F temperature difference between the condensing temperature and ambient air temperature. The coils shall be factory tested to a minimum of 600 psig
- E. Controls: The condenser controls shall include pressure actuated fan cycling controls on each condenser fan motor to maintain proper head pressure control in ambient temperatures down to 0 degree F.

2.5 SOURCE QUALITY CONTROL

- A. Perform functional test of water chiller and remote condenser before shipping.
- B. Factory performance test water chiller, before shipping, according to AHRI 550/590.
 1. Test the following conditions:
 - a. Design conditions indicated.

- b. AHRI 550/590 part-load points.
- C. Factory test and inspect evaporator according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1. Stamp with ASME label.
- D. For remote condenser, rate sound power level according to AHRI 370 procedure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before water chiller installation, examine roughing-in for equipment support, anchor-bolt sizes and locations, piping, controls, and electrical connections to verify actual locations, sizes, and other conditions affecting water chiller performance, maintenance, and operations.
 - 1. Water chiller locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping, controls, and electrical connections.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WATER CHILLER AND REMOTE CONDENSER INSTALLATION

- A. Coordinate sizes and locations of bases with actual equipment provided. Cast anchor-bolt inserts into concrete bases.
- B. Equipment Mounting:
 - 1. Comply with manufacturers requirements for vibration isolation devices.
- C. Maintain manufacturer's recommended clearances for service and maintenance.
- D. Maintain clearances required by governing code.
- E. Chiller manufacturer's factory-trained service personnel shall charge water chiller and condenser with refrigerant if not factory charged and fill with oil if not factory installed.
- F. Install separate devices furnished by manufacturer and not factory installed.
 - 1. Chillers shipped in multiple major assemblies shall be field assembled by chiller manufacturer's factory-trained service personnel.

3.3 PIPING CONNECTIONS

- A. Comply with requirements in Section 232113 "Hydronic Piping" and Section 232114 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Comply with requirements in Section 232300 "Refrigerant Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- C. Where installing piping adjacent to chillers, allow space for service and maintenance.
- D. Evaporator Fluid Connections:
 - 1. Connect to evaporator inlet with shutoff valve, strainer, flexible connector, thermometer, and plugged tee with pressure gage.
 - 2. Connect to evaporator outlet with shutoff valve, balancing valve, flexible connector, flow switch, thermometer, plugged tee with pressure gage, flow meter, and drain connection with valve.
 - 3. Make connections to water chiller with a union, flange or mechanical coupling.
- E. Connect each drain connection with a drain valve, full size of drain connection.
- F. Connect each chiller vent connection with an automatic or a manual vent, full size of vent connection. Automatic air vents shall be piped to drain.

3.4 ELECTRICAL POWER CONNECTIONS

- A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Provide nameplate for each electrical connection indicating electrical equipment designation and circuit number feeding connection. Nameplate shall be laminated phenolic layers of black with engraved white letters at least 1/2 inch high. Locate nameplate where easily visible.

3.5 CONTROLS CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring between chillers and other equipment to interlock operation as required to provide a complete and functioning system.
- C. Provide nameplate on face of chiller control panel indicating control equipment designation serving chiller and the I/O point designation for each control connection. Nameplate shall be laminated phenolic layers of black with engraved white letters at least 1/2 inch high.

3.6 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.

- C. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
 - 1. Verify that refrigerant charge is sufficient and water chiller has been leak tested.
 - 2. Verify that pumps are installed and functional.
 - 3. Verify that thermometers and gages are installed.
 - 4. Operate water chiller for run-in period.
 - 5. Check bearing lubrication and oil levels.
 - 6. Verify that refrigerant pressure relief device for chillers installed indoors is vented outside.
 - 7. Verify proper motor rotation.
 - 8. Verify static deflection of vibration isolators, including deflection during water chiller startup and shutdown.
 - 9. Verify and record performance of water chiller protection devices.
 - 10. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
- D. Visually inspect chiller for damage before starting. Repair or replace damaged components, including insulation. Do not start chiller until damage that is detrimental to operation has been corrected.
- E. Prepare a written startup report that records results of tests and inspections.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water chillers.
 - 1. Instructor shall be factory trained and certified.
 - 2. Provide not less than one hours of training.
 - 3. Train personnel in operation and maintenance and to obtain maximum efficiency in plant operation.
 - 4. Provide instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.
 - 5. Obtain Owner sign-off that training is complete.
 - 6. Owner training shall be held at Project site.

END OF SECTION 236423.21

SECTION 238219

FAN COIL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Ductless fan coil units and accessories.
 - 2. Ducted fan coil units and accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
 - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of fan coil unit indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which fan coil units will be attached.
 - 3. Method of attaching hangers to building structure.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.

- d. Sprinklers.
- e. Access panels.
- 6. Perimeter moldings.

- B. Field quality-control reports.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fan coil units to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fan Coil Unit Filters: Furnish one spare filter for each unit filter installed.
 - 2. Fan Belts: Furnish one spare fan belts for each unit installed.

1.7 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

1.8 COORDINATION

- A. Coordinate layout and installation of fan coil units and suspension system components with other construction that penetrates or is supported by ceilings, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- B. Coordinate size and location of wall sleeves for outdoor-air intake.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Compressor failure.
 - b. Condenser coil leak.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

3. Warranty Period (Compressor Only): 10 years from date of Substantial Completion.
4. All control valves shall be warrantied for a period of 5 years. The warranty shall include all labor and materials to replace defective valves and associated controls.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Factory-packaged and -tested units rated according to AHRI 440, ASHRAE 33, and UL 1995.

2.2 DUCTLESS FAN COIL UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Carrier Corporation; a unit of United Technologies Corp.
 2. Dunham-Bush.
 3. ENVIRO-TEC; by Johnson Controls, Inc.
 4. First Company Products.
 5. Greenheck Fan Corporation.
 6. Trane Inc.
- B. Fan Coil Unit Configurations: Row split.
 1. Number of Cooling/heating Coils: as per schedule
- C. Coil Section Insulation: 1-inch- thick, matte-finish, closed-cell foam complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.
 1. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84 by a qualified testing agency.
 2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- D. Coil Section Insulation: Insulate coil section according to Section 230616 "HVAC Equipment Insulation."
 1. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84 by a qualified testing agency.
 2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- E. Main and Auxiliary Drain Pans: Insulated galvanized steel with plastic liner. Fabricate pans and drain connections to comply with ASHRAE 62.1. Drain pans shall be removable.
- F. Chassis: Galvanized steel where exposed to moisture, with powder-coat finish and removable access panel. Floor-mounting units shall have leveling screws.

- G. Cabinet: Steel with baked-enamel finish in manufacturer's custom paint color as selected by Architect.
 - 1. Vertical Unit Front Panels: Removable, steel, with brushed aluminum bar grill discharge grille and channel-formed edges, cam fasteners, and insulation on back of panel.
 - 2. Horizontal Unit Bottom Panels: Fastened to unit with cam fasteners and hinge and attached with safety chain; with cast-aluminum discharge grilles. (for units that are not ducted)
 - 3. Steel recessing flanges for recessing fan coil units into ceiling or wall.
- H. Outdoor-Air Wall Box: Minimum 0.1265-inch- thick, aluminum, rain-resistant louver and box with integral eliminators and bird screen.
 - 1. Louver Configuration: [Horizontal] [Vertical], rain-resistant louver.
 - 2. Louver Material: [Aluminum] [Steel].
 - 3. Bird Screen: 1/2-inch mesh screen on interior side of louver.
 - 4. Decorative Grille: On outside of intake.
 - 5. Finish: [Anodized aluminum] [Baked enamel], color as selected by Architect from manufacturer's [standard] [custom] colors.
 - 6. Outdoor-Air Damper: Galvanized-steel blades with edge and end seals and nylon bearings; with [electronic] [pneumatic], [two-position] [modulating] actuators.
 - 1. Return-Air Plenum: Sheet metal plenum finished to match the chassis.
 - 2. Mixing Plenum: Sheet metal plenum finished and insulated to match the chassis with outdoor- and return-air, formed-steel dampers.
 - 3. Dampers: Galvanized steel with extruded-vinyl blade seals, flexible-metal jamb seals, and interlocking linkage.
 - 4. Minimum MERV Rating: 5 when tested according to ASHRAE 52.2.
 - 5. Glass Fiber Treated with Adhesive: 80 percent arrestance and MERV 5.
 - 6. Pleated Cotton-Polyester Media: 90 percent arrestance and MERV 7.
- I. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.
- J. Indoor Refrigerant Coils: [Copper] [Stainless-steel] tube, with mechanically bonded [aluminum] [stainless-steel] fins spaced no closer than 0.1 inch and brazed joints at fittings. Comply with AHRI 210/240, and leak test to minimum 450 psig for a minimum 300-psig working pressure. Include thermal expansion valve.
- K. Steam Coils: Copper [distributing] tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 75 psig.
- L. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

- M. Fan and Motor Board: Removable.
 - 1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
 - 2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 3. Wiring Termination: Connect motor to chassis wiring with plug connection.
- N. Factory, Hydronic Piping Package: ASTM B 88, Type L copper tube with wrought-copper fittings and brazed joints. Label piping to indicate service, inlet, and outlet.
 - 1. Two-way, modulating control valve for dual-temperature coil.
 - 2. Hose Kits: Minimum 400-psig working pressure and operating temperatures from 33 to 211 deg F. Tag hose kits to equipment designations.
 - a. Length: 24 inches.
 - b. Minimum Diameter: Equal to fan coil unit connection size.
 - 3. Two-Piece Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.
 - 4. Calibrated-Orifice Balancing Valves: Bronze body, ball type; 125-psig working pressure, 250 deg F maximum operating temperature; with calibrated orifice or venturi, connections for portable differential pressure meter with integral seals, threaded ends, and a memory stop to retain set position.
 - 5. Y-Pattern Hydronic Strainers: Cast-iron body (ASTM A 126, Class B); 125-psig working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 1/2 hose-end, full-port, ball-type blowdown valve in drain connection.
 - 6. Wrought-Copper Unions: ASME B16.22.
- O. Control devices and operational sequences are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."
- P. Basic Unit Controls:
 - 1. Control voltage transformer.
 - 2. Wall-mounting thermostat with the following features:
 - a. Heat-cool-off switch.
 - b. Fan on-auto switch.
 - c. Fan-speed switch.
 - d. Automatic changeover.
 - e. Adjustable deadband.
 - f. Exposed set point.
 - g. Exposed indication.
 - h. Degree F indication.
 - 3. Unoccupied-period-override push button.
 - 4. Data entry and access port.
 - a. Input data includes room temperature, and humidity set points and occupied and unoccupied periods.
 - b. Output data includes room temperature and humidity, supply-air temperature, entering-water temperature, operating mode, and status.
- Q. DDC Terminal Controller:

1. Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.
 2. Unoccupied-Period-Override Operation: Two hours.
 3. Unit Supply-Air Fan Operation:
 - a. Occupied Periods: Fan runs continuously.
 - b. Unoccupied Periods: Fan cycles to maintain room setback temperature.
 4. Hydronic-Cooling-Coil Operation:
 - a. Occupied Periods: Modulate control valve to maintain room temperature.
 - b. Unoccupied Periods: Close control valve.
 5. Dual-Temperature Hydronic-Coil Operation:
 - a. Occupied Periods: When chilled water is available, modulate control valve if room temperature exceeds thermostat set point. When hot water is available, open control valve if temperature falls below thermostat set point.
 - b. Unoccupied Periods: When chilled water is available, close control valve. When hot water is available, modulate control valve if room temperature falls below thermostat setback temperature.
 6. Outdoor-Air Damper Operation:
 - a. Occupied Periods: Open damper to fixed position for [25] <Insert number> percent outdoor air.
 - b. Unoccupied periods: Close damper.
 7. Outdoor-Air Damper Operation:
 8. Occupied Periods:
 9. Outdoor-Air Temperature below Room Temperature: If room temperature is above thermostat set point, modulate outdoor-air damper to maintain room temperature (outdoor-air economizer). If room temperature is below thermostat set point, position damper to fixed minimum position.
 10. Outdoor-Air Temperature above Room Temperature: Position damper to fixed minimum position for [25] <Insert number> percent outdoor air.
 11. Unoccupied Periods: Close damper.
 12. Outdoor-Air Damper Operation (Enthalpy Based):
 13. Occupied Periods:
 14. Outdoor-Air Enthalpy below Room Enthalpy: If room temperature is above room-temperature set point, modulate outdoor-air damper to maintain room temperature (outdoor-air economizer). If room temperature is below set point, position damper to fixed minimum position for [25] <Insert number> percent outdoor air.
 15. Outdoor-Air Enthalpy above Room Enthalpy: Position damper to fixed minimum position for [25] <Insert number> percent outdoor air.
 16. Unoccupied Periods: Close outdoor-air damper and open return-air damper.
 17. Controller shall have volatile-memory backup.
- R. Interface with DDC System for HVAC Requirements:
1. Interface relay for scheduled operation.
 2. Interface relay to provide indication of fault at the central workstation.
 3. Provide BACnet interface for central DDC system for HVAC workstation for the following functions:
 - a. Adjust set points.
 - b. Fan coil unit start, stop, and operating status.
 - c. Data inquiry, including outdoor-air damper position, supply- and room-air temperature.
 - d. Occupied and unoccupied schedules.

S. Electrical Connection: Factory wire motors and controls for a single electrical connection.

T. Capacities and Characteristics: Refer to plans

U. Sequence of Operation

V.

1. Each unit shall be supplied with, and operated through a unit mounted DDC unitary control panel, capable of providing set-point adjustments and all programming control sequences. Controls shall include all motorized dampers, damper motors, control valves, actuators, motor starters, wiring, sensors and all hardware accessories for a complete system. Units shall be provided with all required modules and accessories to allow open communications, and integration with other DDC Control systems.
- 2.
3. Units Off: The automatic 2-way valve on the heating coil shall be open to the coil in winter and closed summer.
4. Fan Operation – in the auto mode the fan shall cycle to maintain set point. In the on mode the fan shall run continuously in the off mode the fan shall be off. The mode shall be selectable at the room smart sensor. The supply fan shall start in high speed for approximately five seconds, then operate continuously at its selected speed, while in the occupied mode. Fan speed shall be manually selected at the wall mounted thermostat. The smart room sensor shall have the capability to override fan speed to maintain temperature set point for each fan coil unit.
5. Winter Operation: Supply fan shall run and the control valve shall modulate hot water flow to maintain space temperature at 75° (adjustable).
6. Summer Operation: supply fan shall run the control valve shall modulate chilled water flow to maintain room set point.
7. Summer/Winter Change over: Heating or cooling mode shall be determined based on water temperature. The fan coil unit coils shall be provided with a bypass capillary. Furnish an aquastat to measure temperature. Limit Controls: Provide a High/low limit control(s) in the supply fan discharge arranged to override temperature controls and prevent discharge temperature from dropping below 50°F and rising above 110°F(adjustable).
8. Economizer Operation (FCU-2&4 only): On a call for cooling when outdoor air conditions permit, (56 deg adjustable) and below, the enthalpy controller shall modulate the outside air intake, exhaust and return air dampers, to maintain SA temp set point. Heating coil control valve shall be closed. Control action shall be that an increase in SA temperature will cause the outside air and exhaust air dampers to modulate towards the open position and the return air damper to modulate towards the closed position. A drop in below set point temperature will cause the reverse to take place. When the outdoor air damper reaches the fully open position a further call for cooling shall cause chilled water system to operate. When ambient conditions are no longer suitable for economizer operation the unit controls shall revert to normal summer operation. The spill fan (EX-1) shall run continuously.
- 9.

10. Freezestat: Provide each unit (with outside air, kitchen only) with a manual reset type freezestat,(set at 35° adjustable),arranged to shut down the unit and sound an audio and visual alarm at the BAS operator station should the set point be reached. The freezestat element shall be the capillary type with lowest point temperature sensing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, to receive fan coil units for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before fan coil unit installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install fan coil units level and plumb.
- B. Install fan coil units to comply with NFPA 90A.
- C. For suspended units, Suspend fan coil units from structure with elastomeric hangers. Vibration isolators are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."
- D. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 60 inches above finished floor.
- E. Install new filters in each fan coil unit within two weeks after Substantial Completion.
- F. Field apply a 1" layer of elastomeric insulation around the outside of all cabinet of all fan coil units.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:
 1. Install piping adjacent to machine to allow service and maintenance.
 2. Connect piping to fan coil unit factory hydronic piping package. Install piping package if shipped loose.
 3. Connect condensate drain to indirect waste.
 - a. Install condensate trap of adequate depth to seal against fan pressure. Install cleanouts in piping at changes of direction.

- B. Connect supply-air and return-air ducts to fan coil units with flexible duct connectors specified in Section 233300 "Air Duct Accessories." Comply with safety requirements in UL 1995 for duct connections.
- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain fan coil units.

END OF SECTION 238219

SECTION 238236 - CONVECTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes hydronic convective heaters.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include details and dimensions of custom-fabricated enclosures.
 - 4. Indicate location and size of each field connection.
 - 5. Indicate location and arrangement of piping valves and specialties.
 - 6. Indicate location and arrangement of integral controls.
 - 7. Include enclosure joints, corner pieces, access doors, and other accessories.
 - 8. Include diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Color Samples for Initial Selection: For convective heaters with factory-applied color finishes.
- E. Color Samples for Verification: For each type of exposed finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Structural members, including wall construction, to which convective heaters will be attached.

2. Method of attaching convective heaters to building structure.
 3. Penetrations of fire-rated wall and floor assemblies.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 HOT-WATER CONVECTORS

- A. Manufactures Subject to compliance with requirements, provide products by one of the following:
1. Slant/Fin Corp.
 2. Sterling HVAC Products; a Mestek company.
 3. Vulcan
 4. Rittling
- B. Heating Elements: Seamless copper tubing mechanically expanded into evenly spaced aluminum fins and rolled into cast- brass headers with inlet/outlet and air vent; steel side plates and supports. Factory-pressure-test element at minimum 100 psig.
1. Element Height: refer to plans
 2. Element Depth: refer to plans
 3. Element Length: refer to plans
 4. Entering-Air Temperature: 65 deg F
 5. Heat Output: refer to plans
 6. Average Water Temperature: 180 deg F
 7. Temperature Drop: 20 deg F.
 8. Pressure Loss:
 9. Heat Output: refer to plans
- C. Front and Top Panel: Minimum 0.0528-inch- thick steel with exposed corners rounded; removable front panels with tamper-resistant fasteners braced and reinforced for stiffness.
- D. Wall-Mounted Back and End Panels: Minimum 0.0428-inch-thick steel.
- E. Floor-Mounted Pedestals: Conceal conduit for power and control wiring at maximum 36-inch spacing. Pedestal-mounted back panel shall be solid panel matching front panel.
- F. Support Brackets: Locate at maximum 36-inch spacing to support front panel and element.
- G. Insulation: 1/2-inch-thick, fibrous glass on inside of the back of the enclosure.
- H. Finish: Baked-enamel finish in manufacturer's custom color as selected by Architect.
- I. Damper: Knob-operated internal damper.
- J. Access Doors: Factory made, permanently hinged with tamper-resistant fastener, minimum size 6 by 7 inches, integral with enclosure.

- K. Enclosure Style: Sloped or flat Flattop refer to schedule.
1. Front Inlet Grille: Punched louver; painted to match enclosure.
 2. Front Inlet Grille: Extruded-aluminum linear bar grille; pencil-proof bar spacing.
 - a. Mill-finish aluminum.
 - b. Anodized finish, color as selected by Architect from manufacturer's standard colors.
 - c. Painted to match enclosure.
 3. Front Outlet Grille: Punched louver; painted to match enclosure.
 4. Top Outlet Grille: Extruded-aluminum linear bar grille; pencil-proof bar spacing.
 - a. Mill-finish aluminum.
 - b. Anodized finish, color as selected by Architect from manufacturer's standard colors.
 - c. Painted to match enclosure.
 5. Enclosure Height: as per schedule
 6. Enclosure Depth: as per schedule .
 7. Enclosure Length: as per schedule

2.2 Minimum Diameter: Equal to connection size

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive convective heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for hydronic-piping connections to verify actual locations before installation of convective heaters.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect hot-water convective heaters and components to piping according to Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties."
 1. Install shutoff valves on inlet and outlet, and balancing valve on outlet.
 2. Install shutoff valve on inlet; install strainer, and shutoff valve on outlet.

- C. Install control valves as required by Section 230923.11 "Control Valves."
- D. Install piping adjacent to convective heaters to allow service and maintenance.
- E. Ground electric convective heaters according to Section 260526 "Grounding and Bonding for Electrical Systems."
- F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Units will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 238236

SECTION 238239.13 - CABINET UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cabinet unit heaters with centrifugal fans and hot-water heating coils.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. DDC: Direct digital control.
- C. PTFE: Polytetrafluoroethylene plastic.
- D. TFE: Tetrafluoroethylene plastic.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include location and size of each field connection.
 - 4. Include details of anchorages and attachments to structure and to supported equipment.
 - 5. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
 - 6. Indicate location and arrangement of piping valves and specialties.
 - 7. Indicate location and arrangement of integral controls.
 - 8. Wiring Diagrams: Power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Samples for Initial Selection: Finish colors for units with factory-applied color finishes.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which cabinet unit heaters will be attached.
 - 3. Method of attaching hangers to building structure.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - 6. Perimeter moldings for exposed or partially exposed cabinets.
- B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Cabinet Unit-Heater Filters: Furnish **one** spare filter(s) for each filter installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide products from one of the following
 - 1. Carrier
 - 2. McQuay
 - 3. Modine
 - 4. Rittling
 - 5. Vulcan
 - 6. Sterling

2.2 DESCRIPTION

- A. Factory-assembled and -tested unit complying with AHRI 440.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 PERFORMANCE REQUIREMENTS

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

2.4 COIL SECTION INSULATION

- A. Insulation Materials: ASTM C 1071; surfaces exposed to airstream shall have aluminum-foil facing to prevent erosion of glass fibers.
 - 1. Thickness: 1 inch.
 - 2. Thermal Conductivity (k-Value): 0.26 Btu x in./h x sq. ft. at 75 deg F mean temperature.
 - 3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
 - 4. Adhesive: Comply with ASTM C 916 and with NFPA 90A or NFPA 90B.
 - 5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- B. Alternative Insulation Materials: Comply with NFPA 90A or NFPA 90B. Unicellular polyethylene thermal plastic, preformed sheet insulation complying with ASTM C 534, Type II, except for density.
 - 1. Thickness: 1 inch.
 - 2. Thermal Conductivity (k-Value): 0.24 Btu x in./h x sq. ft. at 75 deg F mean temperature.
 - 3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM C 411.
 - 4. Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
 - 5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.5 CABINETS

- A. Material: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by Architect or baked-enamel finish with manufacturer's custom paint, in color selected by Architect. Refer to schedule submit color chart for review and approval.
 - 1. **Vertical Unit**; Exposed Front Panels: Minimum 0.0528-inch- thick galvanized sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.

2. Horizontal Unit, Exposed Bottom Panels: Minimum 0.0528-inch- thick galvanized sheet steel, removable panels secured with tamperproof cam fasteners and safety chain.
3. **Recessed Unit**; Flanges: Steel, finished to match cabinet.
4. Control Access Door: Key operated.
5. **Vertical, wall-mounted units**; Base, minimum 0.0528-inch-thick steel, finished to match cabinet, 4 inches or 6 inches high with leveling bolts.
6. Extended Piping Compartment: 8-inch- wide piping end pocket.
7. **Vertical Unit Accessories**;
 - a. False Back: Minimum 0.0428-inch-thick steel, finished to match cabinet.
 - b. Outdoor-Air Wall Box: Minimum 0.1265-inch-thick, aluminum, rain-resistant louver and box with integral eliminators and bird screen; aluminum louver with anodized finish in color selected by Architect from manufacturer's standard or custom colors.
8. **Outdoor-Air Damper**: where indicated on plan shall be galvanized-steel blades with edge and end seals and nylon bearings; with electronic, two-position actuators. Refer to plans and schedules is used.

2.6 FILTERS

- A. Minimum Arrestance: And a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
 1. Glass Fiber Treated with Adhesive: 80 percent arrestance and MERV 5.
 2. Pleated: 90 percent arrestance and MERV 7.

2.7 COILS

- A. Hot-Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain.

2.8 CONTROLS

- A. Fan and Motor Board: Removable.
 1. Fan: Forward curved, double width, centrifugal, directly connected to motor; thermoplastic or painted-steel wheels and aluminum, painted-steel, or galvanized-steel fan scrolls.
 2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
 3. Wiring Terminations: Connect motor to chassis wiring with plug connection.
- B. Factory, Hot-Water Piping Package: ASTM B 88, Type L, copper tube with wrought-copper fittings and brazed joints. Label piping to indicate service, inlet, and outlet.
 1. Two-way, modulating control valve

2. Hose Kits: steel braided flexible connection, minimum 200-psig working pressure, and operating temperatures from 33 to 211 deg F Tag hose kits to equipment designations.
 - a. Length: 6"
 - b. Minimum Diameter: Equal to cabinet unit-heater connection size.
 3. Two-Piece, Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.
 4. Calibrated-Orifice Balancing Valves: Bronze body, ball type, 125-psig working pressure, 250 deg F maximum operating temperature; with calibrated orifice or venture, connection for portable differential pressure meter with integral seals, threaded ends, and equipped with a memory stop to retain set position.
 5. Y-Pattern, Hot-Water Strainers: Cast-iron body (ASTM A 126, Class B); 125-psig minimum working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 1/2 threaded pipe and full-port ball valve in strainer drain connection.
 6. Wrought-Copper Unions: ASME B16.22.
- C. Control devices and operational sequences are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."
- D. DDC Terminal Controller: by building BMS contractor.
1. Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.
 2. Unoccupied Period Override: Two hours.
 3. Unit Supply-Air Fan Operations:
 - a. Occupied Periods: Fan runs continuously.
 - b. Unoccupied Periods: Fan cycles to maintain setback room temperature.
 4. Heating-Coil Operations:
 - a. Occupied Periods: Modulate control valve to provide heating if room temperature falls below thermostat set point.
 - b. Unoccupied Periods: Start fan and modulate control valve if room temperature falls below setback temperature.
 5. Optional Outdoor-Air Damper Operation: (not used)
 - a. Occupied Periods: Open dampers. Delay damper opening if room temperature is more than three degrees below set point.
 - b. Unoccupied Periods: Close damper.
 6. Controller shall have volatile-memory backup.
- E. Interface with DDC System for HVAC Requirements:
1. Terminal unit controller shall be by building DDC system manufacture. It can be field or factory installed and shall be capable of at a minimum the following operation. Refer to the sequence of operation for full unit sequence and further requirements.

2. Interface shall be BAC-net compatible for central DDC system for HVAC workstation and include the following functions:
 - a. Adjust set points.
 - b. Cabinet unit-heater start, stop, and operating status.
 - c. Data inquiry, including supply-air and room-air temperature.
 - d. Occupied and unoccupied schedules.

F. Electrical Connection: Factory-wired motors and controls for a single field connection.

2.9 CAPACITIES AND CHARACTERISTICS.

A. Capacities are as scheduled on plan

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive cabinet unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for **piping and/or** electrical connections to verify actual locations before unit-heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. vertical, wall-mounted cabinet unit heaters with wall boxes and outdoor-air intake louvers.
 1. Install wall boxes in finished wall assembly; seal and weatherproof. Joint-sealant materials and applications are specified in Section 079200 "Joint Sealants."
- B. Install cabinet unit heaters to comply with NFPA 90A.
- C. Suspend cabinet unit heaters from structure with elastomeric hangers. Vibration isolators are specified in Section 230548.13 "Vibration Controls for HVAC."
- D. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.
- E. Install new filters in each fan-coil unit within two weeks of Substantial Completion.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in Section 232113 "Hydronic Piping," Section 232116 "Hydronic Piping Specialties," Section 232213 "Steam and Condensate Heating

Piping," and Section 232216 "Steam and Condensate Heating Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect piping to cabinet unit heater's factory, hot-water piping package. Install the piping package if shipped loose.
- D. Connect supply and return ducts to cabinet unit heaters with flexible duct connectors specified in Section 233300 "Air Duct Accessories." If applicable.
- E. Hot water and steam cabinet unit heaters shall comply with safety requirements in UL 1995.
- F. For hot water cabinet unit heaters, unless otherwise indicated, install union, strainer and ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of cabinet unit heater. Hydronic specialties are specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties."
- G. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- H. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections.
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- B. Units will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust initial temperature set points.
- B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain cabinet unit heaters.

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Main House Renovations Lasdon Park
Arboretum and Veterans Memorial

END OF SECTION 238239.13

SECTION 238239.16 - PROPELLER UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes propeller unit heaters with hot-water and electric coils.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. PTFE: Polytetrafluoroethylene plastic.
- C. TFE: Tetrafluoroethylene plastic.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include location and size of each field connection.
 - 4. Include details of anchorages and attachments to structure and to supported equipment.
 - 5. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
 - 6. Indicate location and arrangement of piping valves and specialties.
 - 7. Indicate location and arrangement of integral controls.
 - 8. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which propeller unit heaters will be attached.
 - 3. Method of attaching hangers to building structure.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Other equipment
- B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For propeller unit heaters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products shall be one of the following;
 - 1. Rattling
 - 2. Sterling
 - 3. Modine
 - 4. Vulcan

2.2 DESCRIPTION

- A. Assembly including casing, coil, fan, and motor in vertical and/or horizontal discharge configuration as scheduled with adjustable discharge louvers.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Electric propeller unit heaters shall comply with UL 2021
- D. Explosion-proof electric propeller unit heaters shall comply with UL 823.

2.3 PERFORMANCE REQUIREMENTS

- A. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

2.4 HOUSINGS

- A. Finish: Manufacturer's standard baked enamel applied to factory-assembled and -tested propeller unit heaters before shipping.
- B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- C. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.

2.5 COILS

- A. General Coil Requirements: Test and rate hot-water propeller unit-heater coils according to ASHRAE 33.
- B. Hot-Water Coil: Copper tube, minimum 0.025-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 325 deg F, with manual air vent. Test for leaks to 350 psig underwater.
- C. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550 deg F at any point during normal operation.
 - 1. Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
 - 2. Wiring Terminations: Stainless-steel or corrosion-resistant material.

2.6 FAN AND MOTOR

- A. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.
- B. Motor: Permanently lubricated, multispeed. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.7 CONTROLS

- A. Control Devices:
 - 1. Wall-mounted, fan-speed switch, and thermostat by BMS contractor.

2.8 CAPACITIES AND CHARACTERISTICS

- A. Heating Capacity are as scheduled or noted on plans.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive propeller unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for **piping and** electrical connections to verify actual locations before unit-heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install propeller unit heaters to comply with NFPA 90A.
- B. Install propeller unit heaters level and plumb.
- C. Suspend propeller unit heaters from structure with all-thread hanger rods and **elastomeric hangers or spring hangers** Hanger rods and attachments to structure are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." Vibration hangers are specified in **Section 230548.13 "Vibration Controls for HVAC."**
- D. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

3.3 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties. Piping installation requirements are specified in the following Sections:
 - 1. Section 232113 "Hydronic Piping."
 - 2. Section 232116 "Hydronic Piping Specialties."
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect piping to propeller unit heater's factory, hot-water piping package. Install the piping package if shipped loose.
- D. For units with hot water coils comply with safety requirements in UL 1995.
- E. For hot water unit, unless otherwise indicated, install union and gate or ball valve and strainer on supply-water connection and union and calibrated balancing valve on return-water

connection of propeller unit heater. Hydronic specialties are specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties."

- F. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- G. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- B. Units will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust initial temperature set points.
- B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain propeller unit heaters.

END OF SECTION 238239.16

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Copper building wire rated 600 V or less.
 - 2. Metal-clad cable, Type MC, rated 600 V or less.
 - 3. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alpha Wire Company.
 - 2. American Bare Conductor.
 - 3. Belden Inc.
 - 4. Cerro Wire LLC.
 - 5. Encore Wire Corporation.
 - 6. General Cable Technologies Corporation.
 - 7. Okonite Company (The).
 - 8. Service Wire Co.

9. Southwire Company.
10. WESCO.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Conductor Insulation:

1. Type NM: Comply with UL 83 and UL 719.
2. Type RHH and Type RHW-2: Comply with UL 44.
3. Type USE-2 and Type SE: Comply with UL 854.
4. Type TC-ER: Comply with NEMA WC 70/ICEA S-95-658 and UL 1277.
5. Type THHN and Type THWN-2: Comply with UL 83.
6. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
7. Type UF: Comply with UL 83 and UL 493.
8. Type XHHW-2: Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. American Bare Conductor.
3. Belden Inc.
4. Encore Wire Corporation.
5. General Cable Technologies Corporation.
6. Okonite Company (The).
7. Service Wire Co.
8. Southwire Company.
9. WESCO.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. RoHS compliant.

4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

1. Single circuit.

- E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

- F. Ground Conductor: Insulated.

G. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.

- H. Armor: Steel or Aluminum, interlocked.

2.3 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M.
2. AFC Cable Systems, Inc.
3. Gardner Bender.
4. Hubbell Power Systems, Inc.
5. Ideal Industries, Inc.
6. ILSCO.
7. NSi Industries LLC.
8. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
9. Tyco Electronics Corp.

- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway, Metal-clad cable, Type MC or Mineral-insulated, metal-sheathed cable, Type MI.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. Perform each of the following visual and electrical tests:
 - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
 - b. Test bolted connections for high resistance using one of the following:
 - 1) A low-resistance ohmmeter.
 - 2) Calibrated torque wrench.
 - 3) Thermographic survey.

- c. Inspect compression-applied connectors for correct cable match and indentation.
 - d. Inspect for correct identification.
 - e. Inspect cable jacket and condition.
 - f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
 - g. Continuity test on each conductor and cable.
 - h. Uniform resistance of parallel conductors.
- 3. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
 - a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- B. Cables will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports to record the following:
 - 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Ground bonding common with lightning protection system.
 - 3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency and testing agency's field supervisor.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Burndy; Part of Hubbell Electrical Systems.
 2. Dossert; AFL Telecommunications LLC.
 3. ERICO International Corporation.
 4. Fushi Copperweld Inc.
 5. Galvan Industries, Inc.; Electrical Products Division, LLC.
 6. Harger Lightning & Grounding.
 7. ILSCO.
 8. O-Z/Gedney; a brand of Emerson Industrial Automation.
 9. Robbins Lightning, Inc.
 10. Siemens Power Transmission & Distribution, Inc.
 11. Thomas & Betts Corporation; A Member of the ABB Group.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
1. Solid Conductors: ASTM B 3.
 2. Stranded Conductors: ASTM B 8.
 3. Tinned Conductors: ASTM B 33.
 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
- G. Conduit Hubs: Mechanical type, terminal with threaded hub.
- H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt or socket set screw.
- I. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
- J. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- K. Straps: Solid copper, copper lugs. Rated for 600 A.
- L. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal two-piece clamp.
- M. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- N. Water Pipe Clamps:
 - 1. Mechanical type, two pieces with stainless-steel bolts.
 - a. Material: Tin-plated aluminum or Die-cast zinc alloy.
 - b. Listed for direct burial.
 - 2. U-bolt type with malleable-iron clamp and copper ground connector.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 5/8 by 96 inches.
- B. Ground Plates: 1/4 inch thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches below grade.
 - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- E. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

- A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.
- D. Pad-Mounted Transformers and Switches: Grounding shall be per power utility company specifications.

3.5 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.6 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. Use exothermic welds for all below-grade connections.
 - 3. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- H. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 4. Pad-Mounted Equipment: 5 ohms.
 5. Manhole Grounds: 10 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Steel slotted support systems.
- 2. Conduit and cable support devices.
- 3. Support for conductors in vertical conduit.
- 4. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Slotted support systems, hardware, and accessories.
- 2. Include rated capacities and furnished specialties and accessories.

- B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

- 1. Hangers. Include product data for components.
- 2. Slotted support systems.
- 3. Equipment supports.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Allied Tube & Conduit; a part of Atkore International.
 - b. B-line, an Eaton business.
 - c. ERICO International Corporation.
 - d. Flex-Strut Inc.
 - e. GS Metals Corp.
 - f. G-Strut.
 - g. Haydon Corporation.
 - h. Metal Ties Innovation.
 - i. Thomas & Betts Corporation; A Member of the ABB Group.
 - j. Unistrut; Part of Atkore International.
 - k. Wesanco, Inc.
 - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 3. Channel Width: Selected for applicable load criteria.
 - 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) B-line, an Eaton business.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 1. NECA 1.
 2. NECA 101
 3. NECA 102.
 4. NECA 105.
 5. NECA 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC and RMC may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.
- B. IMC: Intermediate metal conduit.
- C. EMT: Electrical metallic tubing.

1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. AFC Cable Systems; a part of Atkore International.
 - b. Allied Tube & Conduit; a part of Atkore International.
 - c. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - d. Republic Conduit.
 - e. Southwire Company.
 - f. Thomas & Betts Corporation; A Member of the ABB Group.
 - g. Western Tube and Conduit Corporation.
 - h. Wheatland Tube Company.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. GRC: Comply with ANSI C80.1 and UL 6.
4. IMC: Comply with ANSI C80.6 and UL 1242.
5. EMT: Comply with ANSI C80.3 and UL 797.
6. FMC: Comply with UL 1; zinc-coated steel.
7. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings:

1. Comply with NEMA FB 1 and UL 514B.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
5. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: compression.
6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- C. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AFC Cable Systems; a part of Atkore International.
 - b. Arnco Corporation.
 - c. CANTEX INC.
 - d. CertainTeed Corporation.
 - e. Electri-Flex Company.
 - f. Kraloy.
 - g. RACO; Hubbell.
 - h. Thomas & Betts Corporation; A Member of the ABB Group.
2. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fiberglass:
 - a. Comply with NEMA TC 14.
 - b. Comply with UL 2515 for aboveground raceways.
 - c. Comply with UL 2420 for belowground raceways.
4. ENT: Comply with NEMA TC 13 and UL 1653.
5. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
6. LFNC: Comply with UL 1660.
7. Rigid HDPE: Comply with UL 651A.
8. Continuous HDPE: Comply with UL 651A.
9. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
10. RTRC: Comply with UL 2515A and NEMA TC 14.

B. Nonmetallic Fittings:

1. Fittings, General: Listed and labeled for type of conduit, location, and use.
2. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
 - a. Fittings for LFNC: Comply with UL 514B.
3. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. B-line, an Eaton business.
 - 2. Hoffman; a brand of Pentair Equipment Protection.
 - 3. MonoSystems, Inc.
 - 4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
- C. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
- D. Solvents and Adhesives: As recommended by conduit manufacturer.

2.5 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. MonoSystems, Inc.
 - c. Panduit Corp.
 - d. Wiremold / Legrand.

2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Crouse-Hinds, an Eaton business.
 2. EGS/Appleton Electric.
 3. Erickson Electrical Equipment Company.
 4. Hoffman; a brand of Pentair Equipment Protection.
 5. Hubbell Incorporated; Wiring Device-Kellems.
 6. O-Z/Gedney; a brand of Emerson Industrial Automation.
 7. RACO; Hubbell.
 8. Thomas & Betts Corporation; A Member of the ABB Group.
 9. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Metal Floor Boxes:
 1. Material: Cast metal or sheet metal.
 2. Type: Fully adjustable.
 3. Shape: Rectangular.
 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- H. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.

1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- L. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- M. Gangable boxes are allowed.
- N. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures: Plastic.
 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- O. Cabinets:
 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.
 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Armorcast Products Company.
 - b. NewBasis.
 - c. Oldcastle Enclosure Solutions.
 - d. Oldcastle Precast, Inc.
 - e. Quazite: Hubbell Power Systems, Inc.
2. Standard: Comply with SCTE 77.
 3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 6. Cover Legend: Molded lettering, "ELECTRIC".
 7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.8 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 1. Tests of materials shall be performed by an independent testing agency.
 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed Conduit: GRC or IMC
 2. Concealed Conduit, Aboveground: GRC or IMC
 3. Underground Conduit – Feeders and Branch Circuits: RNC, Type EPC-40-PVC, or Type EPC-80-PVC.
 4. Underground Conduit – Service: HDPE per power utility company specifications.
 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed, Not Subject to Physical Damage: EMT; Surface Metal Raceway is acceptable on 2nd and 3rd floors only.

2. Exposed, Not Subject to Severe Physical Damage: EMT.
 3. Exposed and Subject to Severe Physical Damage: GRC or IMC. Raceway locations include the following:
 - a. Garage
 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 6. Damp or Wet Locations: GRC or IMC.
 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Use compression, steel or cast-metal fittings. Comply with NEMA FB 2.10.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- G. Surface raceways may be installed in Main Building 2nd and 3rd floors only.
- H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from RNC, Type EPC-40-PVC, to GRC or IMC before rising above floor.
- J. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

- Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Surface Raceways:
 - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
 - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- W. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install

- fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC in damp or wet locations not subject to severe physical damage.
- Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.
- Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- BB. Locate boxes so that cover or plate will not span different building finishes.
- CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- EE. Set metal floor boxes level and flush with finished floor surface.
- FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
- 3.3 INSTALLATION OF UNDERGROUND CONDUIT
- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
 2. Install backfill as specified in Section 312000 "Earth Moving."
 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12

- inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
 5. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits but a minimum of 6 inches below grade. Align planks along centerline of conduit.
 6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes with bottom below frost line.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260543
UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Direct-buried conduit, ducts, and duct accessories.
 - 2. Concrete-encased conduit, ducts, and duct accessories.
 - 3. Handholes and boxes.
 - 4. Manholes.

1.3 DEFINITIONS

- A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.
- B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.
- C. Duct Bank:
 - 1. Two or more ducts installed in parallel, with or without additional casing materials.
 - 2. Multiple duct banks.
- D. GRC: Galvanized rigid (steel) conduit.
- E. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include duct-bank materials, including spacers and miscellaneous components.
 - 2. Include duct, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
 - 3. Include accessories for manholes, handholes, boxes, and other utility structures.
 - 4. Include underground-line warning tape.
 - 5. Include warning planks.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

- a. Include plans, elevations, sections, details, attachments to other work, and accessories.
- b. Include duct entry provisions, including locations and duct sizes.
- c. Include reinforcement details.
- d. Include frame and cover design and manhole chimneys.
- e. Include ladder details.
- f. Include grounding details.
- g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
- h. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

- a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
- b. Include duct entry provisions, including locations and duct sizes.
- c. Include cover design.
- d. Include grounding details.
- e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.
- B. Field quality-control reports.

1.6 MAINTENANCE MATERIALS SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to 5 percent of quantity of each item installed.

1.7 FIELD CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Architect, Construction Manager, and Owner no fewer than 30 days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Owner's written permission.

- B. Ground Water: Assume ground-water level is 36 inches below ground surface unless a higher water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND FITTINGS

- A. GRC: Comply with ANSI C80.1 and UL 6.
- B. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

2.2 RIGID NONMETALLIC DUCT

- A. Underground Plastic Utilities Duct: NEMA TC 6 & 8, ASTM F 512, UL 651A, Type HDPE, with matching fittings complying with NEMA TC 9 by same manufacturer as the duct.
- B. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
- C. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 DUCT ACCESSORIES

- A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.
- B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."
 - 1.

2.4 PRECAST CONCRETE HANDHOLES AND BOXES

- A. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
- B. Comply with ASTM C 858 for design and manufacturing processes.
- C. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- D. Cover Legend: Molded lettering, "ELECTRIC."
- E. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.

- F. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
 - 1. Extension shall provide increased depth of 12 inches.
 - 2. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
- G. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
- H. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches vertically and horizontally to accommodate alignment variations.
 - 1. Knockout panels shall be located no less than 6 inches from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
 - 2. Knockout panel opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct.
 - 3. Knockout panels shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
 - 4. Knockout panels shall be 1-1/2 to 2 inches thick.
- I. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 PRECAST MANHOLES

- A. Description: One-piece units and units with interlocking mating sections, complete with accessories, hardware, and features.
- B. Comply with ASTM C 858.
- C. Shall meet NYSEG specifications.
- D. Structural Design Loading: Comply with requirements in "Underground Enclosure Application" Article.
- E. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches vertically and horizontally to accommodate alignment variations.
 - 1. Knockout panels shall be located no less than 6 inches from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls.
 - 2. Knockout panel opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct.
 - 3. Knockout panel shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
 - 4. Knockout panels shall be 1-1/2 to 2 inches thick.
- F. Ground Rod Sleeve: Provide a 3-inch PVC sleeve in manhole floors 2 inches from the wall adjacent to, but not underneath, the duct entering the structure.

- G. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

2.6 UTILITY STRUCTURE ACCESSORIES

- A. Accessories for Utility Structures: Utility equipment and accessory items used for utility structure access and utility support, listed and labeled for intended use and application.
- B. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.
 - 1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A 48/A 48M, Class 30B with milled cover-to-frame bearing surfaces.
 - a. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 - b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.
 - 2. Cover Legend: Cast in. Selected to suit system.
 - a. Legend: "ELECTRIC-LV" for duct systems with power wires and cables for systems operating at 600 V and less.
 - b. Legend: "ELECTRIC-HV" for duct systems with medium-voltage cables.
 - 3. Manhole Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.
 - a. Mortar for Chimney Ring and Frame and Cover Joints: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. where packaged mix complying with ASTM C 387, Type M, may be used.
 - b. Seal joints watertight using preformed plastic or rubber complying with ASTM C 990. Install sealing material according to sealant manufacturers' written instructions.
- C. Manhole Sump Frame and Grate: ASTM A 48/A 48M, Class 30B, gray cast iron.
- D. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch-diameter eye, and 1-by-4-inch bolt.
 - 1. Working Load Embedded in 6-Inch, 4000-psi Concrete: 13,000-lbf minimum tension.
- E. Pulling Eyes in Nonconcrete Walls: Eyebolt with reinforced fastening, 1-1/4-inch-diameter eye, rated 2500-lbf minimum tension.
- F. Pulling-in and Lifting Irons in Concrete Floors: 7/8-inch-diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.
 - 1. Ultimate Yield Strength: 40,000-lbf shear and 60,000-lbf tension.

- G. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch ID by 2-3/4 inches deep, flared to 1-1/4 inches minimum at base.
 - 1. Tested Ultimate Pullout Strength: 12,000 lbf minimum.
- H. Ground Rod Sleeve: 3-inch PVC sleeve in manhole floors 2 inches from the wall adjacent to, but not underneath, the ducts routed from the facility.
- I. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch bolt, 5300-lbf rated pullout strength, and minimum 6800-lbf rated shear strength.
- J. Cable Rack Assembly: Steel, hot-dip galvanized, except insulators.
 - 1. Stanchions: T-section or channel; 2-1/4-inch nominal size; punched with 14 holes on 1-1/2-inch centers for cable-arm attachment.
 - 2. Arms: 1-1/2 inches wide, lengths ranging from 3 inches with 450-lb minimum capacity to 18 inches with 250-lb minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.
 - 3. Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.
- K. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduit, conduit and duct coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.
- L. Fixed Manhole Ladders: Arranged for attachment to roof or wall and floor of manhole. Ladder and mounting brackets and braces shall be fabricated from hot-dip galvanized steel.

2.7 SOURCE QUALITY CONTROL

- A. Test and inspect precast concrete utility structures according to ASTM C 1037.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations

as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.

- C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication according to Section 311000 "Site Clearing."

3.2 UNDERGROUND DUCT APPLICATION

- A. Ducts for Electrical Cables More than 600 V: RNC, NEMA Type HDPE-80-PVC, in concrete-encased duct bank unless otherwise indicated.
- B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type HDPE-80-PVC, in direct-buried duct bank unless otherwise indicated.

3.3 EARTHWORK

- A. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- B. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
- C. Cut and patch existing pavement in the path of underground ducts and utility structures.

3.4 DUCT INSTALLATION

- A. Install ducts according to NEMA TCB 2.
- B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.
- C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations unless otherwise indicated.
- D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- E. Installation Adjacent to High-Temperature Steam Lines: Where duct banks are installed parallel to underground steam lines, perform calculations showing the duct bank will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct bank crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.

- F. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.
 - 1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
 - 2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch.
 - 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- G. Vault Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
- H. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- I. Pulling Cord: Install 100-lbf-test nylon cord in empty ducts.
- J. Concrete-Encased Ducts: Support ducts on duct separators.
 - 1. Excavate trench bottom to provide firm and uniform support for duct bank.
 - 2. Width: Excavate trench 6 inches wider than duct bank on each side.
 - 3. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
 - 4. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 - 5. Elbows: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 2 inches of concrete.
 - b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.
 - 6. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
 - 7. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.

8. Concrete Cover: Install a minimum of 2 inches of concrete cover at top and bottom, and a minimum of 2 inches on each side of duct bank.
9. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
 - a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
 - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing-rod dowels extending a minimum of 18 inches into concrete on both sides of joint near corners of envelope.
10. Pouring Concrete: Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

K. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank.
2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
 - b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
5. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Retain first subparagraph below for direct-buried conduits or duct bank. Retain second subparagraph for concrete-encased duct bank.

- L. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an

additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.5 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units' level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:

1. Manhole Roof: As required for M11-6 manhole.
2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch above finished grade.
3. Install handholes with bottom below frost line.
4. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
5. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Manhole Access: Circular opening in manhole roof; sized to match cover size.

1. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
2. Install chimney, constructed of precast concrete collars and rings, to support cast-iron frame to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for frame to chimney.

D. Waterproofing: Apply waterproofing to exterior surfaces of manholes after concrete has cured at least three days. After ducts have been connected and grouted, and before backfilling, waterproof joints and connections, and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.

E. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.

F. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.

G. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches for manholes and 2 inches for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

3.6 GROUNDING

- A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
 - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch-long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
 - 3. Test manhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.8 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 260543

SECTION 260544
SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Sleeve-seal systems.
 - 3. Sleeve-seal fittings.
 - 4. Grout.
 - 5. Silicone sealants.
- B. Related Requirements:
 - 1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
 - 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 - 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 3. Pressure Plates: Plastic.
 - 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Colors for Raceways Carrying Circuits at More Than 600 V:
 - 1. Black letters on an orange field.
 - 2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."
- D. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch-wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.
- H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- I. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Colors for Cables Carrying Circuits at 600 V and Less:
 1. Black letters on an orange field.
 2. Legend: Indicate voltage and system or service type.
- C. Colors for Cables Carrying Circuits at More Than 600 V:
 1. Black letters on an orange field.
 2. Legend: "DANGER HIGH VOLTAGE WIRING."
- D. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil-thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.
- D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.
- E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- F. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- G. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.
- H. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil-thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.
- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.
- F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- G. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.5 FLOOR MARKING TAPE

- A. 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 - 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
 - 3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE,.

- C. Tag: Type ID:
 - 1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
 - 2. Overall Thickness: 5 mils.
 - 3. Foil Core Thickness: 0.35 mil.
 - 4. Weight: 28 lb/1000 sq. ft..
 - 5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.7 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Baked-Enamel Warning Signs:
 - 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 - 2. 1/4-inch grommets in corners for mounting.
 - 3. Nominal size, 7 by 10 inches.
- C. Metal-Backed, Butyrate Warning Signs:
 - 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
 - 2. 1/4-inch grommets in corners for mounting.
 - 3. Nominal size, 10 by 14 inches.
- D. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.8 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.9 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.
- C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.10 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F.
 - 5. Color: Black.

2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- J. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
- K. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Snap-around labels. Install labels at 10-foot maximum intervals.
- B. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 30-foot maximum intervals.

- C. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Power.
- D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 240-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- E. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.
- F. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- G. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.
- H. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive, self-laminating polyester labels with the conductor designation.
- I. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.
- J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- K. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
 - 1. Limit use of underground-line warning tape to direct-buried cables.
 - 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

- L. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- M. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Metal-backed, butyrate warning signs.
 - 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
 - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- N. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- O. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 - 2. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Switchboards.
 - e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
 - f. Enclosed switches.
 - g. Enclosed circuit breakers.
 - h. Enclosed controllers.
 - i. Variable-speed controllers.
 - j. Push-button stations.
 - k. Contactors.
 - l. Remote-controlled switches, dimmer modules, and control devices.

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- m. Battery-inverter units.
- n. Monitoring and control equipment.

END OF SECTION 260553

SECTION 262416
PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. HID: High-intensity discharge.
- E. MCCB: Molded-case circuit breaker.
- F. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
 - 1. Include materials, switching and overcurrent protective devices, accessories, and components indicated.
 - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details.
 - 2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.

3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Keys: Two spares for each type of panelboard cabinet lock.
 2. Circuit Breakers Including GFCI and GFEP Types: Two spares for each panelboard.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 FIELD CONDITIONS

- A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
 - b. Altitude: Not exceeding 6600 feet.

1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Flush and Surface-mounted, dead-front cabinets.
 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 2. Height: 84 inches maximum.
 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
 4. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.

F. Incoming Mains:

1. Location: Convertible between top and bottom.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

G. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
 - a. Plating shall run entire length of bus.
 - b. Bus shall be fully rated the entire length.
2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

H. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

I. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: 20 percent.

J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.2 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Sector; Eaton Corporation.
 - 2. General Electric Company; GE Energy Management - Electrical Distribution.
 - 3. Siemens Energy.
 - 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - 1. For doors more than 36 inches high, provide two latches, keyed alike.
- D. Mains: Circuit breaker or Lugs only.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.
- G. Branch Overcurrent Protective Devices: Fused switches.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Sector; Eaton Corporation.
 - 2. General Electric Company; GE Energy Management - Electrical Distribution.
 - 3. Siemens Energy.
 - 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Sector; Eaton Corporation.
 - 2. General Electric Company; GE Energy Management - Electrical Distribution.
 - 3. Siemens Energy.
 - 4. Square D; by Schneider Electric.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
 - 3. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
 - 4. Subfeed Circuit Breakers: Vertically mounted.
 - 5. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
 - h. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
 - i. Multipole units enclosed in a single housing with a single handle.
 - j. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

2.5 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

- C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NEMA PB 1.1.
- D. Equipment Mounting:
 - 1. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- F. Mount top of trim 90 inches above finished floor unless otherwise indicated.

- G. Mount panelboard cabinet plumb and rigid without distortion of box.
- H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- I. Mounting panelboards with space behind is recommended for damp, wet, or dirty locations. The steel slotted supports in the following paragraph provide an even mounting surface and the recommended space behind to prevent moisture or dirt collection.
- J. Mount surface-mounted panelboards to steel slotted supports 1 1/4 inch in depth. Orient steel slotted supports vertically.
- K. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
 - 2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- L. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- M. Install filler plates in unused spaces.
- N. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- O. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Perform optional tests. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.

1. Measure loads during period of normal facility operations.

2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.6 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 262726
WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Twist-locking receptacles.
 - 3. Tamper-resistant receptacles.
 - 4. Weather-resistant receptacles.
 - 5. Snap switches and wall-box dimmers.
 - 6. Solid-state fan speed controls.
 - 7. Wall-switch and exterior occupancy sensors.
 - 8. Pendant cord-connector devices.
 - 9. Cord and plug sets.
 - 10. Floor service outlets, and multioutlet assemblies.

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- C. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
 - 2. Hubbell Incorporated; Wiring Device-Kellems.
 - 3. Leviton Manufacturing Co., Inc.
 - 4. Pass & Seymour/Legrand (Pass & Seymour).
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

2.3 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.

- d. Pass & Seymour/Legrand (Pass & Seymour).

2.4 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.5 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.6 DECORATOR-STYLE DEVICES

A. Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).

B. Tamper-Resistant Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.

- C. Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.
- D. GFCI, Feed-Through Type, Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and UL 943 Class A.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
- E. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and UL 943 Class A.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- F. Toggle Switches, Square Face, 120/277 V, 20 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
- G. Lighted Toggle Switches, Square Face, 120 V, 20 A: Comply with NEMA WD 1 and UL 20.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.

- b. Hubbell Incorporated; Wiring Device-Kellems.
- c. Leviton Manufacturing Co., Inc.
- d. Pass & Seymour/Legrand (Pass & Seymour).
- 2. Description: With neon-lighted handle, illuminated when switch is "off."

2.7 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
- C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
 - 1. 600 W; dimmers shall require no derating when ganged with other devices.
- D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.8 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations and Pool Mechanical Rooms: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.9 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

2.10 PREFABRICATED MULTIOUTLET ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Hubbell Incorporated; Wiring Device-Kellems.

2. Wiremold / Legrand.

B. Description:

1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish.

D. Multioutlet Harness:

1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
2. Receptacle Spacing: 18 inches.
3. Wiring: No. 12 AWG solid, Type THHN copper, single circuit.

2.11 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test Instruments: Use instruments that comply with UL 1436.
 - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262813
FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cartridge fuses rated 600 V ac and less for use in the following:
 - a. Control circuits.
 - b. Switchboards.
 - c. Enclosed controllers.
 - d. Enclosed switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
 - 1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 2. Coordination charts and tables and related data.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017700 "Closeout Procedures," include the following:
 - 1. Ambient temperature adjustment information.
 - 2. Current-limitation curves for fuses with current-limiting characteristics.
 - 3. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.6 FIELD CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Bussmann; a division of Cooper Industries.
 - 2. Edison; a brand of Cooper Bussmann; a division of Cooper Industries.
 - 3. Littelfuse, Inc.
 - 4. Mersen USA.
- B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
 - 1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
 - 2. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, fast acting.
 - 3. Type J: 600-V, zero- to 600-A rating, 200 kAIC.
 - 4. Type L: 600-V, 601- to 6000-A rating, 200 kAIC, time delay.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Cartridge Fuses:
 - 1. Service Entrance: Class L, time delay.
 - 2. Feeders: Class RK1, time delay.
 - 3. Motor Branch Circuits: Class RK1, time delay.
 - 4. Large Motor Branch (601-4000 A): Class L, time delay.
 - 5. Power Electronics Circuits: Class J, high speed.
 - 6. Other Branch Circuits: Class J, fast acting.
 - 7. Control Transformer Circuits: Class CC, time delay, control transformer duty.
 - 8. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 2. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
 2. Altitude: Not exceeding 6600 feet.

1.10 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Sector; Eaton Corporation.
 - 2. General Electric Company.
 - 3. Siemens Industry, Inc.
 - 4. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - 4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
 - 5. Lugs: Mechanical type, suitable for number, size, and conductor material.
 - 6. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Sector; Eaton Corporation.
 - 2. General Electric Company.
 - 3. Siemens Industry, Inc.
 - 4. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
 - 4. Lugs: Mechanical type, suitable for number, size, and conductor material.
 - 5. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.3 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Kitchen and Pool Mechanical Room Areas: NEMA 250, Type 4X, stainless steel.
 - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

SECTION 263213
ENGINE GENERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes packaged engine-generator sets for emergency power supply with the following features:
 - 1. Diesel engine.
 - 2. Unit-mounted Remote-mounted cooling system.
 - 3. Unit-mounted and remote-mounted control and monitoring.
 - 4. Performance requirements for sensitive loads.
 - 5. Sound Attenuated Weather Enclosure
 - 6. Critical Silencer.
 - 7. Sub Base Fuel Tank
- B. Related Requirements:
 - 1. Section 263600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.3 DEFINITIONS

- A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. Include thermal damage curve for generator.
 - 3. Include time-current characteristic curves for generator protective device.
 - 4. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.
- B. Shop Drawings:

1. Include plans and elevations for engine-generator set and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Seismic Qualification Certificates: For engine-generator set, accessories, and components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails identify center of gravity and total weight including full fuel tank, supplied enclosure, external silencer, subbase-mounted fuel tank, and each piece of equipment not integral to the engine-generator set, and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Source quality-control reports, including, but not limited to the following:
 1. Certified summary of prototype-unit test report.
 2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
 3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
 4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
 5. Report of sound generation.
 6. Report of exhaust emissions showing compliance with applicable regulations.
 7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
- D. Field quality-control reports.
- E. Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
 - b. Operating instructions laminated and mounted adjacent to generator location.
 - c. Training plan.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: One for every 10 of each type and rating but no fewer than one of each.
 - 2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
 - 3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
 - 4. Tools: Each tool listed by part number in operations and maintenance manual.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved by manufacturer.
- B. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 5 years from date of Substantial Completion.

1.10 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify owner no fewer than ten days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without owner's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Generac Power Systems, Inc.
 2. Kohler Power Systems.
 3. Cummins Power Generation
- B. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. ASME Compliance: Comply with ASME B15.1.
- B. NFPA Compliance:
 1. Comply with NFPA 37.
 2. Comply with NFPA 70.
- C. UL Compliance: Comply with UL 2200.
- D. Engine Exhaust Emissions: Comply with EPA Tier 4 requirements and applicable state and local government requirements.
- E. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
- F. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 1. Ambient Temperature: Minus 15 to plus 40 deg C.
 2. Altitude: Sea level to 1000 feet.

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

- A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.
 - 1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and engine generator center of gravity.
- D. Capacities and Characteristics:
 - 1. Power Output Ratings: 80kW / 80kVA
 - 2. Output Connections: 120/240 Single-phase, three wire.
- E. Engine Generator Performance:
 - 1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.
 - a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.
 - 2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
 - 3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
 - 4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
 - 5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
 - 6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
 - 7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
 - 8. Sustained Short-Circuit Current: For a bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
 - 9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.
 - a. Provide permanent magnet excitation for power source to voltage regulator.
 - 10. Start Time: Comply with NFPA 110, Type 10, system requirements.
- F. Engine Generator Performance for Sensitive Loads:
 - 1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.

- a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.
2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
8. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.
 - a. Provide permanent magnet excitation for power source to voltage regulator.
10. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 DIESEL ENGINE

- A. Fuel: ASTM D 975, diesel fuel oil, Grade 2-D S15.
- B. Rated Engine Speed: 1800 rpm.
- C. Lubrication System: Engine or skid-mounted.
 1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- D. Engine Fuel System:
 1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.

2. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
- E. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499.
- F. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator set mounting frame and integral engine-driven coolant pump.
 1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.
 - a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.
 - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- G. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
 1. Minimum sound attenuation of 25 dB at 500 Hz.
 2. Sound level measured at a distance of 23 feet from exhaust discharge after installation is complete shall be 75 dBA or less.
 3. Muffler location: Inside Enclosure
- H. Starting System: 12 or 24-V electric, with negative ground.
 1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 3. Cranking Cycle: As required by NFPA 110 for system level specified
 4. Battery: Adequate capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least three times without recharging.
 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
 6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.

7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
9. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type. Unit shall comply with UL 1236 and include the following features:
 - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
 - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 to 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 - d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
 - e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
 - f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 DIESEL FUEL-OIL SYSTEM

- A. Comply with NFPA 30.
- B. Base-Mounted Fuel Oil Tank: Factory installed and piped, double wall, complying with UL 142 fuel oil tank. Features include the following:
 1. Tank level indicator.
 2. Usable Capacity: At least 30 hours continuous at 100% load.
 3. Vandal-resistant fill cap.
 4. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.6 CONTROL AND MONITORING

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.
- B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates

generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

- C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate NEC 700 circuit breakers from other loads.
- D. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:
 - 1. AC voltmeter.
 - 2. AC ammeter.
 - 3. AC frequency meter.
 - 4. DC voltmeter (alternator battery charging).
 - 5. Engine-coolant temperature gage.
 - 6. Engine lubricating-oil pressure gage.
 - 7. Running-time meter.
 - 8. Ammeter-voltmeter, phase-selector switch(es).
 - 9. Generator-voltage adjusting rheostat.
 - 10. Generator overload.
- E. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.
- F. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals. Data system connections to terminals are covered in Division 26 Section "Electrical Power Monitoring and Control."
- G. Common Remote Audible Alarm: Signal the occurrence of any events listed below without differentiating between event types. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset.
 - 1. Engine high-temperature shutdown.
 - 2. Lube-oil, low-pressure shutdown.
 - 3. Overspeed shutdown.
 - 4. Remote emergency-stop shutdown.
 - 5. Engine high-temperature prealarm.
 - 6. Lube-oil, low-pressure prealarm.
 - 7. Fuel tank, low-fuel level.
 - 8. Low coolant level.
- H. Remote Alarm Annunciator: Comply with NFPA 99 & 110. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.
- I. Remote Emergency-Stop Switch: Supplied in a break-glass type enclosure unless otherwise indicated; and labeled. Button shall be protected from accidental operation.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.
- B. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.
 - 1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
 - 2. Trip Settings: Selected to coordinate with generator thermal damage curve.
 - 3. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices. Include shunt trips and auxiliary contacts.
 - 4. Mounting: Adjacent to, or integrated with, control and monitoring panel.
- C. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other engine generator protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:
 - 1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other engine generator malfunction alarms. Contacts shall be available for load shed functions.
 - 2. Under single- or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
 - 3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.
 - 4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.
- D. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide 12-lead alternator.

- E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- F. Enclosure: Dripproof.
- G. Instrument Transformers: Mounted within generator enclosure.
- H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.
 - 1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
- I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
- J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

2.9 OUTDOOR ENGINE GENERATOR ENCLOSURE

- A. Description: Vandal-resistant, sound-attenuating, weatherproof steel housing; wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.
- B. Description: Prefabricated or preengineered enclosure with the following features:
 - 1. Construction: Galvanized-steel, metal-clad, integral structural-steel-framed enclosure erected on concrete foundation.
 - 2. Structural Design and Anchorage: Comply with ASCE 7 for wind loads.
 - 3. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.
 - 4. Hinged Doors: With padlocking provisions.
 - 5. Ventilation: Louvers equipped with bird screen and filter arranged to permit air circulation while excluding exterior dust, birds, and rodents.
 - 6. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
 - 7. Muffler: Critical Grade within generator enclosure
 - 8. Sound Level: Not to exceed 75dBA @ 23 ft (7M)
- C. Provide Interior Illumination via AC/DC LED lighting kit with DC circuit wired to generator battery. Include light switch with timer to minimize battery draw.
- D. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.
 - 1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
- E. Convenience Outlets: Factory wired GFCI. Arrange for external electrical connection.

- F. Pre-wired Load Center: All generator accessories shall be factory-wired to load center.

2.10 FINISHES

- A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.11 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 - 1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.
- B. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
 - 1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
 - 2. Test generator, exciter, and voltage regulator as a unit.
 - 3. Full load run.
 - 4. Maximum power.
 - 5. Voltage regulation.
 - 6. Transient and steady-state governing.
 - 7. Single-step load pickup.
 - 8. Safety shutdown.
 - 9. Provide 30 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
 - 10. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.
- B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Owner no fewer than 10 working days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Owner's written permission.

3.3 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 37 & 110.
- B. Equipment Mounting:
 - 1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified with concrete.
 - 2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
- C. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

- A. Piping installation requirements are specified in Division 23 Sections.
- B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 IDENTIFICATION

- A. Identify system components according to Section 260553 "Identification for Electrical Systems."
- B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections:
 - 1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below, as specified in NETA ATS. Certify compliance with test parameters.
 - a. Visual and Mechanical Inspection:
 - 1) Compare equipment nameplate data with Drawings and the Specifications.
 - 2) Inspect physical and mechanical condition.
 - 3) Inspect anchorage, alignment, and grounding.
 - 4) Verify that the unit is clean.
 - b. Electrical and Mechanical Tests:
 - 1) Perform insulation-resistance tests according to IEEE 43.
 - a) Machines Larger Than 200 hp Test duration shall be 10 minutes. Calculate polarization index.
 - b) Machines 200 hp or Less: Test duration shall be one minute. Calculate the dielectric-absorption ratio.
 - 2) Test protective relay devices.
 - 3) Verify phase rotation, phasing, and synchronized operation as required by the application.
 - 4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
 - 5) Perform vibration test for each main bearing cap.
 - 6) Verify correct functioning of the governor and regulator.
 - 2. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
 - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
 - 3. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
 - 4. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.

5. Exhaust Emissions Test: Comply with applicable government test criteria.
 6. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
 7. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 and 100 percent of rated linear load. Verify that harmonic content is within specified limits.
 8. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four locations on the property line and compare measured levels with required values.
- C. Coordinate tests with tests for transfer switches and run them concurrently.
- D. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.
- E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.
- F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
- G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- H. Remove and replace malfunctioning units and retest as specified above.
- I. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.
- J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- K. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels so terminations and connections are accessible to portable scanner.
1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 263213

SECTION 26 36 00
TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes transfer switches rated 600 V and less, including the following:
 - 1. Automatic transfer switches.
 - 2. Service Entrance Rating.
 - 3. Remote annunciation and control systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
 - 1. Single-Line Diagram: Show connections between transfer switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
 - 1. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - 1. Features and operating sequences, both automatic and manual.
 - 2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.
- B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- C. Source Limitations: Obtain automatic transfer switches bypass/isolation switches remote annunciator and control panels through one source from a single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NEMA ICS 1.
- F. Comply with NFPA 70.
- G. Comply with NFPA 110.
- H. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Contactor Transfer Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Schneider Electric; ASCO Power Technologies, LP.
- b. Generac Industrial Power
- c. Kohler Power Systems; Generator Division.
- d. Onan/Cummins Power Generation; Industrial Business Group.
- e. Eaton Corp.
- f. GE Zenith Controls.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

- A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
- B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
- C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.
- F. Service-Rated Transfer Switch:

1. Comply with UL 869A and UL 489.
 2. Provide terminals for bonding the grounding electrode conductor to the grounded service conductor.
 3. In systems with a neutral, the bonding connection shall be on the neutral bus.
 4. Provide removable link for temporary separation of the service and load grounded conductors.
 5. Surge Protective Device: Service rated.
 6. Ground-Fault Protection: Comply with UL 1008 for normal and alternative buses.
 7. Service Disconnecting Means: Externally operated, manual mechanically or electrically actuated.
- G. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
1. Switch Action: Double throw; mechanically held in both directions.
 2. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.
- H. Neutral Terminal: Solid and fully rated, unless otherwise indicated.
- I. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.
- J. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.
- K. Battery Charger: For generator starting batteries.
1. Float type rated 2 A.
 2. Ammeter to display charging current.
 3. Fused ac inputs and dc outputs.
- L. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.
- M. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 260553 "Identification for Electrical Systems."
1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
- N. Enclosures: General-purpose NEMA 250, Type 3R, complying with NEMA ICS 6 and UL 508, unless otherwise indicated. Include anti-condensation heater for enclosures located outdoors.

2.3 DISCONNECTING & OVERCURRENT PROTECTION

- A. The normal (utility) connection shall be provided with a thermal magnetic rated molded case circuit breaker with current ratings as shown on the plans.
- B. All of the proper disconnecting, protection, grounding and bonding required for service entrance equipment shall be provided within the enclosure.

2.4 AUTOMATIC TRANSFER SWITCHES

- A. Comply with Level 1 equipment according to NFPA 110.
- B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.
- C. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.
- D. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.
- E. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.
- F. Automatic Open-Transition Transfer Switches: Include the following functions and characteristics:
 - 1. Fully automatic break-before-make operation.
 - 2. Load transfer with interruption. There shall be no momentary interconnection of both power sources.
- G. Automatic Transfer-Switch Features:
 - 1. Controller operates through a period of loss of control power.
 - 2. Undervoltage Sensing for Each Phase of Normal and Alternate Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
 - 3. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
 - 4. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
 - 5. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
 - 6. Test Switch: Simulate normal-source failure.
 - 7. Switch-Position Pilot Lights: Indicate source to which load is connected.

8. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
 - a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
9. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
10. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
11. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
 - a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
 - b. Push-button programming control with digital display of settings.
 - c. Integral battery operation of time switch when normal control power is not available.

2.5 REMOTE ANNUNCIATOR AND CONTROL SYSTEM

- A. Functional Description: Include the following functions for indicated transfer switches:
 1. Indication of sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
 2. Indication of switch position.
 3. Indication of switch in test mode.
 4. Indication of failure of digital communication link.
 5. Key-switch or user-code access to control functions of panel.
 6. Control of switch-test initiation.
 7. Control of switch operation in either direction.
- B. Malfunction of annunciator, annunciation and control panel, or communication link shall not affect functions of automatic transfer switch. In the event of failure of communication link, automatic transfer switch automatically reverts to stand-alone, self-contained operation. Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation.

- C. Remote Annunciation and Control Panel: Solid-state components. Include the following features:
 - 1. Controls and indicating lights grouped together for each transfer switch.
 - 2. Label each indicating light control group. Indicate transfer switch it controls, location of switch, and load it serves.
 - 3. Digital Communication Capability: Matched to that of transfer switches supervised.
 - 4. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.

2.6 SOURCE QUALITY CONTROL

- A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.
- B. Prepare test and inspection reports.
 - 1. For each of the tests required by UL 1008, performed on representative devices, for emergency systems. Include results of test for the following conditions:
 - a. Overvoltage.
 - b. Undervoltage.
 - c. Loss of supply voltage.
 - d. Reduction of supply voltage.
 - e. Alternative supply voltage or frequency is at minimum acceptable values.
 - f. Temperature rise.
 - g. Dielectric voltage-withstand; before and after short-circuit test.
 - h. Overload.
 - i. Contact opening.
 - j. Endurance.
 - k. Short circuit.
 - l. Short-time current capability.
 - m. Receptacle withstand capability.
 - n. Insulating base and supports damage.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Floor-Mounting Switch: Anchor to floor by bolting.
 - 1. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Section 260529 "Hangers and Supports for Electrical Systems."
 - 2. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
 - 3. Provide workspace and clearances required by NFPA 70.

- B. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.
- C. Identify components according to Section 260553 "Identification for Electrical Systems."
- D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.
- E. Comply with NECA 1.

3.2 CONNECTIONS

- A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.
- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
 - a. Check for electrical continuity of circuits and for short circuits.
 - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - c. Verify that manual transfer warnings are properly placed.
 - d. Perform manual transfer operation.
 - 4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

- a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
 - b. Simulate loss of phase-to-ground voltage for each phase of normal source.
 - c. Verify time-delay settings.
 - d. Verify pickup and dropout voltages by data readout or inspection of control settings.
 - e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
 - f. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
- C. Coordinate tests with tests of generator and run them concurrently.
- D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- E. Remove and replace malfunctioning units and retest as specified above.
- F. Prepare test and inspection reports.
- G. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.
 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Section 017900 "Demonstration and Training."
- B. Coordinate this training with that for generator equipment.

END OF SECTION 26 36 00

SECTION 264113
LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes lightning protection system for ordinary structures.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include layouts of the lightning protection system, with details of the components to be used in the installation.
 - 2. Include raceway locations needed for the installation of conductors.
 - 3. Details of air terminals, ground rods, ground rings, conductor supports, splices, and terminations, including concealment requirements.
 - 4. Include roof attachment details, coordinated with roof installation.
 - 5. Calculations required by NFPA 780 for bonding of metal bodies.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Lightning protection system Shop Drawings, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Lightning protection cabling attachments to roofing systems and accessories.
 - 2. Lightning protection strike termination device attachment to roofing systems, coordinated with the roofing system manufacturer.
 - 3. Lightning protection system components penetrating roofing and moisture protection systems and system components, coordinated with the roofing system manufacturer.
- B. Qualification Data: For Installer.
- C. Product Certificates: For each type of roof adhesive for attaching the roof-mounted air terminal assemblies, approved by the roofing-material manufacturer.
- D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For lightning protection system to include in maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Dimensioned site plan showing dimensioned route of the ground loop conductor and the ground rod locations. Comply with requirements of Section 017839 "Project Record Documents."
 - b. A system testing and inspection record, listing the results of inspections and ground resistance tests, as recommended by NFPA 780, Annex D.
- B. Completion Certificate:
 - 1. UL Master Label Certificate.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: UL-listed installer, category OWAY or LPI Master Installer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Advanced Lightning Technology, LTD.
 - 2. East Coast Lightning Equipment Inc.
 - 3. ERICO International Corporation.
 - 4. Harger Lightning & Grounding.
 - 5. Heary Bros. Lightning Protection Co. Inc.
 - 6. Independent Protection Co.
 - 7. National Lightning Protection.
 - 8. Preferred Lightning Protection.
 - 9. Robbins Lightning, Inc.
 - 10. Thompson Lightning Protection, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. UL Lightning Protection Standard: Comply with UL 96A requirements for Class I buildings.
- B. Lightning Protection Components, Devices, and Accessories: Listed and labeled by a qualified testing agency as complying with UL 96, and marked for intended location and application.

2.3 MATERIALS

A. Air Terminals:

1. Copper or Stainless steel unless otherwise indicated.
2. Pointed tip.
3. Integral base support or Threaded base support.

B. Class 1 Main Conductors:

1. Stranded Copper: 57,400 circular mils in diameter.

C. Secondary Conductors:

1. Stranded Copper: 26,240 circular mils in diameter.

D. Ground Rods:

1. Material: Copper-clad steel.
2. Diameter: 5/8 inch.
3. Rods shall be not less than 120 inches long.

E. Conductor Splices and Connectors: Compression fittings that are installed with hydraulically operated tools, or exothermic welds, approved for use with the class type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lightning protection components and systems according to UL 96A.

B. Install conductors with direct paths from air terminals to ground connections. Avoid bends less than 90 degrees and 8 inches in radius and narrow loops.

C. Conceal conductors within normal view from exterior locations at grade within 200 feet of building. Comply with requirements for concealed installations in UL 96A.

1. Roof penetrations required for down conductors and connections to structural-steel framework shall be made using listed through-roof fitting and connector assemblies with solid rods and appropriate roof flashings. Use materials approved by the roofing manufacturer for the purpose. Conform to the methods and materials required at roofing penetrations of the lightning protection components to ensure compatibility with the roofing specifications and warranty.
2. Install conduit where necessary to comply with conductor concealment requirements.
3. Air Terminals on Single-Ply Membrane Roofing: Comply with adhesive manufacturer's written instructions.

D. Ground Ring Electrode: The conductor shall be not less than the main-size lightning conductor.

3.2 CONNECTIONS

- A. Aboveground concealed connections, and connections in earth or concrete, shall be done by exothermic welds or by high-compression fittings listed for the purpose.
- B. Aboveground exposed connections shall be done using the following types of connectors, listed and labeled for the purpose: bolted connectors, exothermic weld, high compression, crimp.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3.3 CORROSION PROTECTION

- A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.
- B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Perform inspections as required to obtain a UL Master Label for system.
- B. Prepare test and inspection reports and certificates.

END OF SECTION 264113

SECTION 26 51 19
LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior solid-state luminaires that use LED technology.
 - 2. Lighting fixture supports.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- H. Product Data: For each type of product.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaires.
 - 4. Include emergency lighting units, including batteries and chargers.
 - 5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
 - 6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80.

- a. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
- B. Shop Drawings: For nonstandard or custom luminaires.
 1. Include plans, elevations, sections, and mounting and attachment details.
 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 3. Include diagrams for power, signal, and control wiring.
- C. LEED Submittals:
 1. Product Data for Credit IEQ 4.2: For paints and coatings, documentation including printed statement of VOC content.
 1. Laboratory Test Reports for Credit IEQ 4.2: For paints and coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- A. Samples: For each luminaire and for each color and texture with standard factory-applied finish.
- B. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.
 1. Include Samples of luminaires and accessories involving color and finish selection.
- C. Samples for Verification: For each type of luminaire.
 1. Include Samples of luminaires and accessories to verify finish selection.
- D. Product Schedule: For luminaires and lamps. See schedule on contract drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Lighting luminaires.
 2. Suspended ceiling components.
 3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
 4. Structural members to which luminaires will be attached.
 5. Initial access modules for acoustical tile, including size and locations.
 6. Items penetrating finished ceiling, including the following:
 - a. Other luminaires.

- b. Air outlets and inlets.
- c. Speakers.
- d. Sprinklers.
- e. Access panels.

7. Moldings.

- A. Qualification Data: For testing laboratory providing photometric data for luminaires.
- A. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Product Certificates: For each type of luminaire.
- C. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Diffusers and Lenses: Two for every 100 of each type and rating installed. Furnish at least one of each type.
 - 3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- A. Provide luminaires from a single manufacturer for each luminaire type.
- B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

- C. Mockups: For interior lighting luminaires in room or module mockups, complete with power and control connections.
 - 1. Obtain Architect's approval of luminaires in mockups before starting installations.
 - 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- A. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- A. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- B. Recessed Fixtures: Comply with NEMA LE 4.
- C. Bulb shape complying with ANSI C79.1.
- D. Lamp base complying with ANSI C81.61.
- A. CRI of minimum 80. CCT of 3000 K unless otherwise noted on drawings.
- B. Rated lamp life of 50,000 hours.
- C. Lamps dimmable from 100 percent to 0 percent of maximum light output.

- D. Internal driver.
- E. Nominal Operating Voltage: 120 V ac.
 - 1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- B. Housings:
 - 1. Extruded-aluminum housing and heat sink.
 - 2. Anodized finish or as noted on the drawings.

2.2 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
 - 1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Retain "Glass" Subparagraph below if first, second, third, or fourth option in "Diffusers and Globes" Paragraph above is retained.
 - 3. Glass: Annealed crystal glass unless otherwise indicated on the drawings.
 - 1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- B. Housings:
 - 1. Extruded-aluminum housing and heat sink.
 - 2. Anodized finish.
- C. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI for all luminaires.

2.3 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.4 LUMINAIRE FIXTURE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

- A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaire Support:
1. Attached to a minimum 20 gauge backing plate attached to wall structural members.
 2. Do not attach luminaires directly to gypsum board.
- G. Ceiling-Mounted Luminaire Support:
1. Ceiling mount with pendant mount with 5/32-inch- diameter aircraft cable supports adjustable to 120 inches in length.
- H. Suspended Luminaire Support:
1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod wire support for suspension for each unit length of luminaire chassis, including one at each end.
 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- I. Ceiling-Grid-Mounted Luminaires:
1. Secure to any required outlet box.
 1. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
 1. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.
- B. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.

- C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

- A. Comply with requirements for startup specified in Section 260943.16 "Addressable-Fixture Lighting Controls."
- B. Comply with requirements for startup specified in Section 260943.23 "Relay-Based Lighting Controls."

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
 - 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
 - 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

SECTION 265219
EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Emergency lighting units.
 - 2. Exit signs.
 - 3. Luminaire supports.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.
- D. Fixture: See "Luminaire" Paragraph.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.
 - 1. Include data on features, accessories, and finishes.
 - 2. Include physical description of the unit and dimensions.
 - 3. Battery and charger for light units.
 - 4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
 - 5. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.
 - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

- B. Shop Drawings: For nonstandard or custom luminaires.
 - 1. Include plans, elevations, sections, and mounting and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
- C. Product Schedule:
 - 1. For emergency lighting units. Use same designations indicated on Drawings.
 - 2. For exit signs. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of luminaire.
- B. Product Test Reports: For each luminaire for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Luminaire-mounted, emergency battery pack: One for every 20 emergency lighting units. Furnish at least one of each type.
 - 3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
 - 4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two year(s) from date of Substantial Completion.
- B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Emergency Power Unit Batteries: 5 years from date of Substantial Completion. Full warranty shall apply for the entire warranty period.
 - 2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for the entire warranty period.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.
- C. Comply with NFPA 70 and NFPA 101.
- D. Comply with NEMA LE 4 for recessed luminaires.
- E. Comply with UL 1598 for fluorescent luminaires.
- F. Lamp Base: Comply with ANSI C81.61 or IEC 60061-1.
- G. Bulb Shape: Complying with ANSI C79.1.
- H. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast.
 - 1. Emergency Connection: Operate one lamp(s) continuously at an output of 1100 lumens each upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
 - 2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay

- disconnects lamps from battery, and battery is automatically recharged and floated on charger.
3. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Less than 0 deg F or exceeding 104 deg F, with an average value exceeding 95 deg F over a 24-hour period.
 - b. Ambient Storage Temperature: Not less than minus 4 deg F and not exceeding 140 deg F.
 - c. Humidity: More than 95 percent (condensing).
 - d. Altitude: Exceeding 3300 feet.
 4. Nightlight Connection: Operate lamp continuously at 40 percent of rated light output.
 5. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 6. Battery: Sealed, maintenance-free, nickel-cadmium type.
 7. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
 8. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.

2.2 EMERGENCY LIGHTING

- A. General Requirements for Emergency Lighting Units: Self-contained units.
- B. Emergency Luminaires:
 1. See plans for proposed manufacturers.
 2. Emergency Luminaires: As indicated on Interior Lighting Fixture Schedule, with the following additional features:
 - a. Operating at nominal voltage of 120 V ac or 277 V ac.
 - b. Internal emergency power unit.
 - c. Rated for installation in damp locations, and for sealed and gasketed luminaires in wet locations.
 - d. UL 94 flame rating.
- C. Emergency Lighting Unit:
 1. See plans for proposed manufacturers.
 2. Emergency Lighting Unit: As indicated on Interior Lighting Fixture Schedule.
 3. Operating at nominal voltage of 120 V ac or 277 V ac.
 4. Wall with universal junction box adaptor.
 5. UV stable thermoplastic housing, rated for damp locations.
 6. Two Halogen lamp heads.
 7. Internal emergency power unit.
- D. Remote Emergency Lighting Units:
 1. See plans for proposed manufacturers.

2. Emergency Lighting Unit: As indicated on Interior Lighting Fixture Schedule.
3. Operating at nominal voltage of 120 V ac or 277 V ac.
4. Wall with universal junction box adaptor.
5. UV stable thermoplastic housing, rated for damp locations.
6. Two Halogen lamp heads.
7. External emergency power unit.

2.3 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 1. See plans for proposed manufacturers.
 2. Operating at nominal voltage of 120 V ac or 277 V ac.
 3. Lamps for AC Operation: Fluorescent, two for each luminaire; 20,000 hours of rated lamp life.
 4. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.
 5. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.
 6. Master/Remote Sign Configurations:
 - a. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in LED power supply for power connection to remote unit.
 - b. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.

2.4 MATERIALS

- A. Metal Parts:
 1. Free of burrs and sharp corners and edges.
 2. Sheet metal components shall be steel unless otherwise indicated.
 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access:
 1. Smooth operating, free of light leakage under operating conditions.
 2. Designed to permit relamping without use of tools.
 3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
 1. Prismatic acrylic.
 2. Acrylic: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- D. Housings:
 1. Extruded aluminum housing and heat sink.

2. Powder coat finish.

E. Conduit: Electrical metallic tubing or flexible metallic conduit, minimum 3/4 inch in diameter.

2.5 METAL FINISHES

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Support Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire and emergency power unit weight.
 - 2. Able to maintain luminaire position when testing emergency power unit.
 - 3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.

4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.
- E. Wall-Mounted Luminaire Support:
 1. Attached to structural members in walls.
 2. Do not attach luminaires directly to gypsum board.
- F. Suspended Luminaire Support:
 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- G. Ceiling Grid Mounted Luminaires:
 1. Secure to any required outlet box.
 2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
 3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

3.5 STARTUP SERVICE

- A. Perform startup service:
 1. Charge emergency power units and batteries minimum of one hour and depress switch to conduct short-duration test.
 2. Charge emergency power units and batteries minimum of 24 hours and conduct one-hour discharge test.

3.6 ADJUSTING

- A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:
 - 1. Inspect all luminaires. Replace lamps, emergency power units, batteries, signs, or luminaires that are defective.
 - a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 2. Conduct short-duration tests on all emergency lighting.

END OF SECTION 265219