

LAN

LAN ASSOCIATES

ENGINEERING ▪ PLANNING ▪ ARCHITECTURE ▪ SURVEYING, LLP

252 MAIN STREET, GOSHEN, NY 10924

PHONE: (845) 615-0350 FAX: (845) 615-0351

CONTRACT DOCUMENTS

AND

TECHNICAL SPECIFICATIONS

FOR

INTERIOR RENOVATIONS

AT

VILLAGE OF WOODBURY BUILDING DEPARTMENT,

HIGHLAND MILLS, NY 10930

Village of Woodbury Building Department
19 Adams Street,
Highland Mills, NY 10930

Telephone No. 845-291-2750

Contact: Mr. Gary Thomasberger,
Building/Zoning Inspector Code Enforcement Officer

LAN Job #4.1523.01

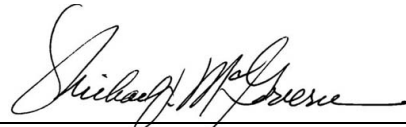
Out to Bid: December 28, 2020

**CONTRACT DOCUMENTS
AND
TECHNICAL SPECIFICATIONS
FOR
INTERIOR RENOVATIONS
AT
VILLAGE OF WOODBURY BUILDING DEPARTMENT,
HIGHLAND MILLS, NY 10930**

Village of Woodbury Building Department
19 Adams Street,
Highland Mills, NY 10930

Telephone No. 845-291-2750

Contact: Mr. Gary Thomasberger,
Building/Zoning Inspector Code Enforcement Officer

A handwritten signature in black ink, appearing to read "Michael J. McGovern", is written over a horizontal line.

Michael J. McGovern, RA
NY RA #022257

LAN Job #4.1523.01
Out to Bid: December 28, 2020

TABLE OF CONTENTS

<u>DIVISION NO.</u>	<u>TITLE</u>	<u>PAGE NO.</u>
DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS		
00 02 00	Notice to Bidders	000200-1
00 10 00	Instructions to Bidders	001000-1
00 30 00	Bid Form-Contract 1G General Construction	003000-1
00 41 00	Bid Bond	004100-1
00 43 00	Stockholder & Partnership Interest Affidavit	004300-1
00 48 00	Non-Collusive Affidavit	004800-1
00 49 00	Contractor's Qualification Statement	004900-1
00 49 50	Disclosure of Prior Non-Responsibility Determinations	004950-1
00 49 51	Iran Divestment Act Certification	004951-1
00 50 00	SAMPLE Public Improvement Contract	005000-1
00 61 00-A	Performance Bond	006100A-1
00 61 00-B	Payment Bond	006100B-1
00 61 00-C	Maintenance Bond	006100C-1
00 81 00	Prevailing Wage Schedule & Project Labor Agreement	008100-1
DIVISION 01 – GENERAL REQUIREMENTS		
01 00 00	General Conditions	007000-1
01 10 00	Summary of Work	011000-1
01 23 00	Alternates	012300-1
01 31 00	Project Management and Coordination	013100-1
01 32 33	Photographic Documentation	013233-1
01 33 00	Submittal Procedures	013300-1
01 40 00	Quality Requirements	014000-1
01 50 00	Temporary Facilities and Controls	015000-1
01 56 10	Temporary Fencing	015610-1
01 73 00	Execution Requirements	017300-1
01 73 20	Selective Demolition	017320-1
01 77 00	Closeout Procedures	017700-1
01 78 23	Operation and Maintenance Data	017823-1
01 78 39	Project Record Documents	017839-1
DIVISION 02 – DEMOLITION		
02 41 00	Demolition	024100-1
DIVISION 03 – CONCRETE		
03 54 16	Cement-Based, Interior, Self Leveling Underlayment	035416-1
DIVISION 04 – MASONRY		
04 01 10	Masonry Cleaning	040110-1
04 01 20	Unit Masonry Restoration	040120-1
DIVISION 05 – METALS		
05 40 00	Cold Formed Steel Framing	054000-1

<u>DIVISION NO.</u>	<u>TITLE</u>	<u>PAGE NO.</u>
DIVISION 06 – WOOD, PLASTICS AND COMPOSITES		
06 10 00	Rough Carpentry	061000-1
06 10 53	Miscellaneous Rough Carpentry	061053-1
DIVISION 07 – THERMAL AND MOISTURE PROTECTION		
07 92 00	Joint Sealants	079200-1
DIVISION 08 – OPENINGS		
08 43 13	Thermally Broken Aluminum-Framed Storefronts	084313-1
DIVISION 09 – FINISHES		
09 29 00	Gypsum Board	092900-1
09 91 13	Exterior Painting	099113-1
09 91 23	Interior Painting	099123-1
DIVISION 13 – SPECIAL CONSTRUCTION		
13 12 50	Super-Lumideck	131250-1
DIVISION 22 – PLUMBING		
22 00 00	Plumbing Summary of Work	220000-1
22 05 01	Basic Plumbing Materials and Methods	220501-1
22 05 17	Sleeves and Sleeve Seals for Plumbing	220517-1
22 05 18	Escutcheons for Plumbing Piping	220518-1
22 05 19	Meters and Gages for Plumbing Piping	220519-1
22 05 23	Valves	220523-1
22 05 29	Hangers and Supports for Plumbing Piping and Equipment	220529-1
22 05 48	Vibration Controls	220548-1
22 05 53	Identification for Plumbing Piping and Equipment	220553-1
22 07 19	Plumbing Piping Insulation	220719-1
22 11 16	Domestic Water Piping	221116-1
22 11 19	Domestic Water Piping Specialties	221119-1
22 13 16	Sanitary Waste and Vent Piping	221319-1
22 13 19	Sanitary Waste Piping Specialties	223319-1
22 41 00	Plumbing Fixtures	224100-1
DIVISION 23 – HEATING VENTILATING AND AIR CONDITIONING		
23 00 00	Mechanical Summary of Work	230000-1
23 05 00	Common Work Results for HVAC	230500-1
23 05 13	Common Motor Requirements for HVAC Equipment	230513-1
23 05 29	Hangers and Supports for HVAC Piping and Equipment	230529-1
23 05 53	Mechanical Identification	230553-1
23 05 93	Testing, Adjusting, and Balancing	230593-1
23 07 19	Piping Insulation	230719-1
23 09 93	Sequence of Operations for HVAC controls	230993-1

<u>DIVISION NO.</u>	<u>TITLE</u>	<u>PAGE NO.</u>
DIVISION 23 – HEATING VENTILATING AND AIR CONDITIONING (continue)		
23 23 00	Refrigerant Piping	232300-1
23 31 13	Metal Ducts	233113-1
23 33 00	Air Duct Accessories	233300-1
23 34 16	Centrifugal HVAC Fans	233416-1
23 37 13	Diffusers, Registers, and grilles	233713-1
23 81 26	Split-System Air-Conditioners	238126-1

DIVISION 26 – ELECTRICAL

26 05 00	Basic Electrical Materials and Methods	260500-1
26 05 01	Electrical-General.....	260501-1
26 05 10	Wiring Methods	260510-1
26 05 18	Low-Voltage Electrical Power Conductors and Cables	260518-1
26 05 19	Wire and Cable	260519-1
26 05 26	Grounding and Bonding for Electrical Systems	260526-1
26 05 29	Hangers and Supports for Electrical Systems	260529-1
26 05 33	Raceways.....	260533-1
26 05 34	Raceways and Boxes.....	260534-1
26 05 48.16	Seismic Controls for Electrical Systems	260548.16-1
26 05 53	Electrical Identification	260553-1
26 24 16	Panelboards	262416-1
26 27 13	Electricity Metering.....	262713-1
26 27 25	Wiring Connections.....	262725-1
26 27 26	Wiring Devices	262726-1
26 28 16	Enclosed Switches And Circuit Breakers.....	262816-1
26 51 00	Lighting.....	265100-1
26 51 19	LED Interior Lighting	265119-1

DIVISION 27 – COMMUNICATIONS

27 05 00	Common Work Results for Communications.....	270500-1
27 05 26	Grounding and Bonding for Communications.....	270526-1
27 05 28	Pathways for Communications Systems.....	270528-1
27 10 00	Structured Cabling	271000-1
27 13 00	Communications Backbone Cabling.....	271300-1
27 15 00	Communications Horizontal Cabling.....	271500-1
27 66 00	Communications Equipment Rooms and Fitting.....	276600-1

LIST OF TABLES

<u>Table No.</u>	<u>Title</u>	<u>Page No.</u>
1-1	Liquidated Damages	011000-37

LIST OF DRAWINGS

(Not Bound in Specifications)

<u>Drawing No.</u>	<u>Title</u>
T0.01	Title Sheet & General Notes
A1.01	Demolition Plan
A1.02	Demolition Reflected Ceiling Plan
A1.03	Roof Plan
A2.01	Proposed Floor Plan
A3.01	Proposed Elevations
A5.01	Reflected Ceiling Plan, Notes, & Details
A6.01	Door Schedule, Door Types, and Details
A7.01	Proposed Interior Elevations
A8.01	Details
M0.01	Mechanical General Notes, Legend & Abbreviations
M1.01	Partial Mechanical Floor Plan – Demolition
M2.01	Partial Mechanical Floor Plan
M6.01	Mechanical Schedules
M6.02	Mechanical Details
E0.01	Cover Sheet
E1.01	Electrical Demolition Sheet
E2.01	Proposed Electrical Plan
E5.01	Proposed Lighting Plan & Details
P1.01	Partial Plumbing Plan
P2.01	Partial Plumbing Plan Proposed
P6.01	Plumbing Schedules, Details & Notes

SECTION 000200

NOTICE TO BIDDERS

Interior Renovations at Village of Woodbury Building Department
19 Adams Street, Highland Mills, NY 10930

Sealed bids for Interior Renovations of the Village of Woodbury Building Department will be received by Ms. Desiree Potvin, Village Clerk, of the Village of Woodbury, at the Village of Woodbury, 455 Route 32, Highland Mills, NY 10930 up to and including January 26, 2021 at 2:00P.M. prevailing time. No bids will be received after 2:00P.M., at which time the bids shall be publicly opened and read aloud. **Due to the current COVID-19 pandemic, bids will be publicly opened and read aloud at 2:00p.m. via livestream on Zoom at the following URL Address:**

<https://us02web.zoom.us/j/86284414179?pwd=WnU2dFVvcjNpbytoeStZRGZmSGdCZz09> ,

using computer audio, or call in audio via phone: 1 929-205-6099 MEETING ID #: 862 8441 4179, PASSCODE: 936925.

A Pre-Bid Conference and site walk will be held at 19 Adams Street, Highland Mills, NY 10930 at **11:00A.M., on January 11, 2021.** Attendance by prospective Bidders is **strongly recommended.** Please be advised that masks are mandatory and temperature scan will be done upon entry to the building.

The plans and specifications may be examined/obtained at REV Ventures, Inc., 330 Route 17A, Suite 3, Goshen, NY 10924, or at their website www.usinglesspaper.com or by phone (845) 651-3845 between 9:00 a.m. and 5:00 p.m. Monday through Friday beginning on **December 28, 2020.** A bid deposit of \$50 payable to Village of Woodbury by check or money order is required to obtain printed documents. The deposit is refundable if the bid documents are returned in good condition within 30 days after the bid date. Complete digital sets of Bidding Documents, drawings and specifications may also be viewed online with a free user account or downloaded for a non-refundable fee of Forty-Nine (\$49.00) dollars at www.usinglesspaper.com under public projects.

Please note that all bidders must obtain bid packages from REV Ventures, Inc. or at their website www.usinglesspaper.com in order to submit a bid for this project. REV Ventures, Inc. or their website www.usinglesspaper.com is the **ONLY** authorized distributor of the bid package and all bidders must be on their bidders list.

All bid addenda will be transmitted to registered plan holders via email and will be available at www.usinglesspaper.com. Plan holders who have paid for hard copies of the bid documents will need to make the determination if hard copies of the addenda are required for their use, and coordinate directly with Rev. Ventures Inc. for hard copies of addenda to be issued. There will be no charge for registered plan holders to obtain hard copies of the bid addenda.

All technical questions, comments, and inquiries should be directed to LAN (Attention Mr. Christopher Carucci, at telephone number 845-615-0350, fax number 845-615-0351 or email christopher.carucci@lanassociates.com).

Awarded Contractors shall be required to provide Performance and Payment Bonds, each equal to 100% of the Contract amount and insurance coverages as specified in the Contract Documents, with the Village of Woodbury, and Architect named as additional insureds, and prior to Final Payment, a one-year Maintenance Bond against any defects in workmanship or materials in an amount equal to 10% of the Contract Price at Substantial Completion.

ADDITIONAL BIDDING REQUIREMENTS ARE INCLUDED IN THE INSTRUCTIONS TO BIDDERS.

DATED: December 8, 2020

BY: Ms. Desiree Potvin
Village Clerk
Village of Woodbury
455 Route 32
Highland Mills, NY 10930

SECTION 001000

INSTRUCTIONS TO BIDDERS

1.0 PRE-BID CONFERENCE

- 1.1 A pre-bid conference and site walk will be held at the **19 Adams Street, Highland Mills, New York, on January 11, 2021 at 11:00A.M.** prevailing time. Attendance by prospective Bidders is **strongly recommended**. Any bidder that does not attend the Pre-Bid conference and site walk will still be deemed to be on notice and aware of all that the Pre-Bid Conference and site walk reveal.

2.0 RESTRICTED COMMUNICATIONS

- 2.1 Pursuant to State Finance Law §139-j and §139-k, this solicitation includes and imposes certain restrictions on communications between the Owner and a bidder during the procurement process. A bidder is restricted from contacting persons other than designated staff from the earliest notice of intent to solicit offers through final award and approval of the Procurement Contract by Desiree Potvin/Village Clerk/Treasurer ("restricted period") unless it is a contact that is included among certain statutory exceptions set forth in State Finance Law §139-j(3)(a). Owner employees are required to obtain certain information when contacted during the restricted period. The designated staff contact is the Desiree Potvin/Village Clerk/Treasurer or her representative, telephone (845) 928-7558 x1253, fax (845) 928-9278. Bidders responding to this Advertisement must familiarize themselves with these State Finance Law requirements and will be expected to affirm that they understand and agree to comply on the Bid Form.

3.0 COPIES OF BID DOCUMENTS

- 3.1 Complete sets of Bid Documents shall be used in preparing Bids. Neither Owner nor Architect assumes any responsibilities for errors or misinterpretations resulting from the use of incomplete sets of Bid Documents. Only the documents obtained from the official source should be relied upon. The only "official source" is REV Ventures, Inc., 330 Route 17A, Suite 3, Goshen, NY 10930.
- 3.2 In making copies of Bid Documents available, Owner, Construction Manager and Architect does so only for the purpose of obtaining Bids on the Work and do not confer permission or a license or grant for any other use.
- 3.3 There shall be a \$50 refund for each full set of Bid Documents returned in good condition within 30 days after the date of the Notice of Award.

4.0 EXAMINATION OF BID DOCUMENTS AND SITE

- 4.1 Before submitting a Bid, each Bidder must (a) examine the Bid Documents thoroughly, (b) visit the Site to familiarize itself with local conditions that may in any manner affect cost, progress or performance of the Work, (c) familiarize itself with Federal, State and local laws, ordinances, rules and regulations that may, in any manner, affect cost, progress or performance of the Work, and (d) study and carefully correlate Bidder's observations with the requirements of the Bid Documents.
- 4.2 The lands upon which the Work is to be performed and the rights-of-way for access thereto and other lands designated for use by Contractor in performing the Work are identified on the Drawings.
- 4.3 Surveys, investigative and clearance reports (such as investigative reports of subsurface or latent physical conditions, hazardous materials, etc) obtained by Owner or Architect, if any, shall be enclosed in the Project Manual and/or provided as completed during the term of the Agreement. These reports are for informational purposes only and are not guaranteed or warranted as to accuracy, completeness or quantities.

- 4.4 The submission of a Bid will constitute an incontrovertible representation by the Bidder that it has complied with every requirement of the Instructions to Bidders and that the Bid Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

5.0 INTERPRETATIONS; NON-SPECIFIED PRODUCTS; ADDENDA

- 5.1 All questions about the meaning or intent of the Bid Documents may be submitted until **5:00 P.M.** prevailing time on **January 21, 2021**. Questions submitted prior to this deadline shall be responded to through the Addendum process. Questions submitted after the deadline shall receive no response. Submit questions per Section 5.3 of General Conditions.
- 5.2 Written clarifications or interpretations will be issued by Addenda before the bid opening date. Only questions answered by written Addenda will be binding. Oral and other clarifications or interpretations will be without legal effect. Addenda will be sent by overnight service and/or e-mail, to all parties recorded as having received the Bid Documents from the official source.
- 5.3 Each Bidder must be responsible for determining that it has received all Addenda issued and shall acknowledge receipt of all Addenda on the Bid Form, and by faxing acknowledgement back to the Village Clerk at (845) 928-9278.

6.0 BID SECURITY

- 6.1 Each Bid must be accompanied by Bid Bond or a Cashier's Check issued by a responsible surety, bank or trust company acceptable to the Owner (collectively, "Bid Security"), payable to Village of Woodbury. The Bid Security shall be in the amount of TEN PERCENT (10%) of the Bid Price.
- 6.2 In case a party to whom a Contract is awarded fails to execute a Contract in the form enclosed in the Bid Documents, and/or furnish the required Bonds, and/or Certificate(s) of Insurance within ten (10) days of the Notice of Award, Owner may determine that the Bidder has abandoned the Bid and Contract, and the Bid Security accompanying the Bid Form shall be forfeited to Owner as liquidated damages for such failure and to indemnify said Owner for any loss sustained by Bidders failure to act. After execution by Owner of a Contract and acceptance of the Bonds by Owner, the Bid Security accompanying the Bid Form of the successful Bidder will be returned in accordance with the terms and conditions of the Contract Documents.

7.0 PERFORMANCE, PAYMENT, MAINTENANCE, AND OTHER BONDS

- 7.1 Performance and Payment Bonds: The Contractor shall furnish Performance and Payment Bonds each in an amount equal to ONE HUNDRED PERCENT (100%) of the total Contract Price as security for the faithful performance of this Contract and for the payment of all persons performing labor or furnishing materials in connection with this Contract.
- 7.2 Maintenance Bond: Upon application for Final Payment, the Contractor shall provide the Owner with a Maintenance Bond in the amount of TEN PERCENT (10%) of the total Contract Price at Substantial Completion which shall remain in effect for one year from the date of issue of Final Payment check to Contractor, as a guarantee that the Contractor shall make good any faults or defects in the Work arising from improper or defective workmanship or materials which may appear during that period. The Maintenance Bond shall be in addition to any other warranties, guarantees or similar obligations called for in the Contract Documents.
- 7.3 Acceptable Types of Security: Acceptable types of security shall be limited to a Bond in a form satisfactory to the Owner or a Cashier's Check. The surety company for all Bonds must be licensed in the State of New York, have an A.M. Best Rating of A- or better, and appear on the most recent published Department of the Treasury's Listing of Approved Sureties (Department Circular 570) at

the time of filing the Bonds.

7.4 Power of Attorney: Attorneys-in-fact who sign Performance or Payment Bonds must file with each bond a certified copy of their Power of Attorney to sign said Bonds.

7.5 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the Bonds or shall permit a copy to be made.

8.0 CONTRACT TIME

8.1 The Contractor agrees and covenants that TIME IS OF THE ESSENCE and the Contract Time shall commence on the date specified in the Contract. The Contractor further agrees that **Substantial Completion shall be achieved within 90 calendar days from the notice to proceed and that Final Completion shall be achieved within 14 days of Substantial Completion.** Liquidated damages as specified in the Owner-Contractor Agreement shall apply for failure to comply with Substantial and Final Completion deadlines. Further, the Contractor agrees that there will be no damages for any project delays caused by the Owner, its representatives or LAN and that the Contractor's sole remedy for such delays is an extension of time to complete the work.

9.0 RESERVED

10.0 SAFETY AND HEALTH REGULATIONS

10.1 This Project is subject to, and the Contractor shall apply with, all applicable Federal, State and Local Laws, regulations, ordinances, codes, rules and requirements.

10.2 The Contractor shall have a competent person or persons, as may be required under the Federal Occupational Safety and Health Act, on the Site to inspect the Work and to supervise the conformance of the Work with OSHA regulations and any other necessary or applicable health and safety standards and practices.

11.0 NONDISCRIMINATION IN EMPLOYMENT

11.1 Contracts for work under this Project will obligate the Contractor and Subcontractors not to discriminate in employment practices.

11.2 Bidders shall indicate in their Bids whether they have previously performed work subject to the President's Executive Order No. 11246 and the applicable regulations.

12.0 OTHER BID PRICING ISSUES

12.1 The materials to be incorporated into the Project or Work as set forth in the Contract Documents are exempt from New York State sales tax.

12.2 Contractor acknowledges that the Contract Price and detailed schedule for completion of the Work are based on its own knowledge and judgment of the conditions and hazards involved, and not upon any representation of the Owner or Architect. The Owner and Architect assume no responsibility for any understanding or representation made by any of their representatives during or prior to execution of this Contract unless such understanding or representations are expressly stated in the Contract and the Contract expressly provides that the responsibility is assumed by Owner, Construction Manager, or Architect. The cost of all of the following will be included in the Contract Price and Contractor shall have full responsibility for:

.1 Review and checking all such information and data;

- .2 Locating all Underground Facilities shown or indicated in the Contract Documents;
 - .3 Coordination of the Work with the owners of such Underground Facilities during construction; and
 - .4 The safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.
- 12.3 Allowances shall cover the cost to the Contractor of materials and equipment delivered at the Site and required taxes, if any, less applicable trade discounts; Contractor's costs for unloading and handling at the Site, labor, installation costs, overhead, profit and other expenses contemplated for stated Allowance amounts shall be included in the Contract Sum and not in the Allowances.
- 12.4 The previously listed items in Section 12 are examples of provisions that may impact bid pricing. Contractor is responsible for reading the Bid Documents in full to ascertain that it understands and accounts for all cost impacts. The Owner shall assume no liability for and has no obligation to compensate Contractor for failure to consider such impacts in the calculation of bid prices. By submitting a Bid, Contractor certifies that it has read and understood this provision and the rest of the Bid Documents and has submitted pricing in accordance with its own observations, correlations, and investigations of and among the Bid Documents, the Site, the labor market, materials and equipment costs, legal and regulatory requirements, and other pertinent factors.

13.0 BID FORM

- 13.1 Each Bid shall be submitted on the forms included in **Section 003000** of the Bid Documents. The forms shall be removed and submitted separately. All blank spaces for Bid Prices must be filled in with the Unit Price for the item or the Lump Sum for which the Bid is made. All blank spaces for any Alternates shall be filled in with Lump Sum Amounts for that work.
- 13.2 Bid Forms shall be completed in ink or by typewriter. The Bid price of each item on the form shall be stated in words and figures. If unit prices are required on the Bid Form, discrepancies between unit prices and their respective total amounts will be resolved in favor of the unit prices. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.
- 13.3 Bids by corporations shall be executed in the corporate name by a duly authorized person, shall be accompanied by evidence of authorization to sign the bid and bind the corporation and a certified corporate resolution designating the duly authorized individual shall accompany the Bid. Additionally, the corporate seal shall be affixed and attested to by a corporate officer. The complete corporate address and state of domestic incorporation shall be shown below the signature. Any corporation or limited liability corporation not incorporated in the State of New York must be properly registered under applicable New York law and show proof that they are authorized to do business in New York State.
- 13.4 Bids by partnerships shall be executed in the partnership name and shall be signed by the partner(s) authorized to make the bid and bind the partnership. The partner's title shall appear below his/her signature and evidence of such authority must accompany the Bid. The primary business address of the partnership shall be shown below the signature. Any limited partnership or limited liability partnership must be properly registered under applicable New York law and show proof that they are authorized to do business in New York State.
- 13.5 All names shall be typed or printed below the signature.
- 13.6 The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which shall be

filled in on the Bid Form).

- 13.7 The name, address, fax, email and telephone number to which communications regarding the Bid are to be directed shall be provided.

14.0 SUBMISSION OF BIDS

- 14.1 One (1) original (marked as "Original") and three (3) copies of each bid must be submitted on the forms furnished in this Request for Bids and/or addenda address to Village of Woodbury, Desiree Potvin, Village Clerk, 455 Route 32, Highland Mills, NY 10930. Bids must be enclosed in a sealed opaque envelope and plainly marked with the name and address of the Bidder, the Prime Contract being bid and the Project Title "Government Center Building- Alterations and Additions Project". If submitted by mail, the sealed envelope marked as described above and containing the bid shall be enclosed in another envelope with the notation "BID ENCLOSED" on the face and addressed as indicated in the Invitation to Bid. Each Bid must be accompanied by a Bid Bond or Certified Check made payable to the VILLAGE OF WOODBURY, Village Clerk, in the amount of TEN PERCENT (10%) of the Bid and a minimum of five (5) references for satisfactory completion of work at least equal in size and complexity to the Work proposed. The following documents must also be enclosed with the Bid:

1. Bid Bond – Section 004100
2. Bid Form – Section 003000 – 1 original and 3 copies
3. Stockholder & Partnership Affidavit – Section 004300
4. Non-Collusive Affidavit – Section 004800
5. Contractor's Qualifications Statement – Section 004900
6. Disclosure of Prior Non-Responsibility Determinations – Section 004950
7. Iran Divestment Act- Section 00 4951
8. Corporation Resolution and Seal
9. Certificate of Authority to do business in New York

15.0 RECEIPT OF BIDS; WITHDRAWAL

- 15.1 Sealed Bids will be received at the time and place indicated in the Notice to Bidders as may be modified by Addenda.
- 15.2 Owner, in its sole discretion, may refuse to consider as non-responsive any Bid not prepared and/or not submitted in accordance with the Bid Documents.
- 15.3 Bidders are cautioned that it is the responsibility of each individual Bidder to assure that its Bid is in the possession of the responsible official or his or her designated alternate prior to the stated time and at the place of opening of the Bid. Owner is not responsible for Bids delayed by mail and/or delivery services of any nature.
- 15.4 Bids may be withdrawn prior to the scheduled time (or authorized postponement thereof) for Bid Opening.
- 15.5 Any Bid received after the specified time for Bid Opening shall not be considered. No Bidder may withdraw its Bid for a period of forty-five (45) calendar days, after the actual date of the Bid Opening, without the consent of the Commissioner of Public Works, solely at the Commissioner's discretion.

16.0 LOWEST RESPONSIVE AND RESPONSIBLE BIDDER

- 16.1 A contract may be awarded to the Lowest Responsive and Responsible Bidder. The term "Lowest Responsive and Responsible Bidder" as used herein shall mean the Bidder whose Total Bid Price is determined by the Owner to be the lowest of those Bidders determined to possess the skill, ability, expertise, experience, qualifications, integrity, financial capability and other qualities

necessary for the faithful performance of the Work, and whose bid is fully responsive to the bidding documents without qualification or limitation in its effect. The Owner may consider Alternate pricing, if any, solely at its discretion, in determining the Low Bidder.

- 16.2 Owner reserves the right to reject any and all Bids, to decline to make an award, to waive any and all informalities, to disregard any nonconforming, nonresponsive or conditional Bids, and to act in Owner's best interest.
- 16.3 All Bidders shall complete and submit as part of their Bids the Contractor's Qualifications Statement, and be prepared to submit within five (5) days of Owner's request, written evidence of any additional information and data requested by the Owner to make the determination that the Contractor has the requisite qualifications, in the opinion of the Owner, to perform Work set forth in the Contract Documents.
- 16.4 Bidders may be further investigated by Owner, Construction Manager and Architect to determine if they are responsible, qualified and eligible to perform the Work. The investigation of a Bidder may include, among other factors, whether the organization is adequate in size, is authorized to do business in the jurisdiction where the Project is located, has had sufficient and successful previous experience, and whether available equipment, financial resources, expertise, and other factors are adequate to assure Owner that the Work will be completed in accordance with the terms of a contract. The amount of other work to which the Bidder is committed may also be considered.
- 16.5 In evaluating Bids, Owner reserves the right to consider the qualifications of only those Bidders whose Bids are in compliance with the prescribed requirements and therefore are considered responsive.
- 16.6 Pursuant to State Finance Law §139-j and §139-k, the Owner is required to make a determination of the responsibility of any Bidder. Certain findings of non-responsibility can result in rejection for contract award and in the event of two findings within a 4-year period the Bidder is debarred from obtaining governmental Procurement Contracts. Bidders must familiarize themselves with these State Finance Law requirements and will be expected to affirm that they understand and agree to comply on the bid form.
- 16.7 Owner reserves the right to reject the Bid of any Bidder that is non-responsive or that the Owner considers non-responsible if they do not possess the qualities set forth herein as evaluated through the Qualifications Statement, Bidder Disclosure of Prior Non-Responsibility Determinations, and any additional information requested or investigation done by the Owner.

17.0 AWARD AND EXECUTION OF CONTRACT

- 17.1 No Bid shall be withdrawn for a period of forty-five (45) days after Bid Opening without the consent of the Commissioner of Public Works, at the Commissioner's sole discretion.
- 17.2 No Contract will be awarded to any individual or entity not properly registered to do business in the State of New York in accordance with applicable New York laws.
- 17.3 If a contract is to be awarded, Owner will give the Lowest Responsive and Responsible Bidder a Notice of Award after bid opening and due diligence is performed. The successful Bidder will be required to execute a Contract. For a violation of this provision, the Bidder shall forfeit its Bid Security to the Owner as liquidated damages. Unsuccessful bidders shall have their Bid Security checks returned to them within forty-five (45) days of the Bid Opening.
- 17.4 Subsequent to a Notice of Award to the Lowest Responsive and Responsible Bidder, multiple unsigned copies of the Contract and all other applicable Contract Documents will be delivered to that bidder. Within ten (10) calendar days, after the date of receipt of such Contract Documents,

the Contractor shall execute and return to Owner all copies of the Contract and all other applicable Contract Documents, including without limitation, required bonds and certificates of insurance. Thereafter, upon all required reviews and approvals, the Owner will deliver one fully signed copy to Contractor. The Owner shall incur no obligations, contractual or otherwise, unless and until the Owner both executes the Contract and delivers to the Contractor a written Notice to Proceed. Failure to submit all required documentation may result in disqualification of the Bidder as non-responsible and forfeiture of Bid Security.

18.0 SPECIAL NOTICE

- 18.1 Bidders are responsible for reading and seeking clarification of all Bid Documents prior to submitting a bid.

END OF SECTION 001000

SECTION 003000

**BID FORM FOR
CONTRACT NO. 1G – GENERAL CONSTRUCTION**

NAME OF CONTRACTOR SUBMITTING BID:

(PLEASE PRINT)

PART 1 – GENERAL

The undersigned declares that the Bid is made without any collusion with any other persons, firms, or corporations; that the Bidder has carefully examined all Bid Documents as prepared by LAN Associates Engineering, Planning, Architecture, Surveying LLP at 252 Main Street, Goshen, NY 10924 dated December 28, 2020; that the Bidder has informed itself fully regarding all conditions pertaining to the Work and the place where it is to be performed; that the undersigned has full authority to submit this Bid from the entity on behalf of which he or she is signing; and that with these representations, the undersigned makes this Bid. These prices shall cover all expenses incurred in performing the Work set forth in the Bid Documents and Contract. If a contract is awarded and fully executed, the Bid Documents and Bid Form shall become a part of the Contract.

All Bids shall remain open for forty-five (45) calendar days, after the actual date of the opening of the Bids.

The premiums for all Bonds and/or insurance required shall be paid by Contractor.

The undersigned further agrees that the Bid Security accompanying this Bid shall be forfeited to Owner if the Bidder fails to execute the contract and deliver proof of insurance and bonds in the manner and timeframe stated in the Bid Documents. **Award is conditional upon receipt of such documents in the stated timeframe and Owner reserves the right, but not the obligation, to declare a Bidder who does not comply with the timeframe nonresponsive, rescind the conditional award and proceed to the next Lowest Responsive and Responsible Bidder.**

The undersigned hereby agrees to all obligations and terms contained in the Bid Documents, shall commence on the date specified in the Contract and agrees that the **Substantial Completion Date shall be no later than 90 calendar days after Notice to Proceed and Final Completion Date shall be no later 14 calendar days after Substantial completion** in accordance with the terms as stated in such Contract. The undersigned agrees to pay Owner liquidated damages in accordance with the provisions for such stated in the Contract Documents, for each day beyond Substantial Completion and/or Final Completion.

PART 2 – ACKNOWLEDGEMENT OF RECEIPT OF ADDENDA

The undersigned acknowledges the receipt of addenda:

Addendum #1: _____
(date received) (Signature of Individual or Officer Signing this Bid)

Addendum #2: _____
(date received) (Signature of Individual or Officer Signing this Bid)

Addendum #3: _____
(date received) (Signature of Individual or Officer Signing this Bid)

PART 3 – ALTERNATES

In accordance with the above understanding, the undersigned proposes to perform the Work, furnish all materials, and complete the Work in its entirety in the manner and under the conditions required in the Bid Documents and for the ALTERNATES listed as follows:

Alternates are all Lump Sum prices.

- A. **ADD ALTERNATE #1** – POWER WASH EXISTING STUCCO ON SOUTH FAÇADE AND REPAIR SEVENTY-FIVE (75) LINEAR FEET OF CRACKS PER DRYVIT DOCUMENT DS498 “DRYVITCARE™ EIFS REPAIR PROCEDURES.” APPLY “DRYVIT” NCB (NON-CEMENTITIOUS BASE COAT) WITH REINFORCING MESH AND APPLY “DRYVIT” TEXTURED FINISH COAT PER MANUFACTURER’S RECOMMENDATIONS.

\$_____ LUMP SUM

PART 4 – TOTAL BID PRICE

In accordance with the above understanding, the undersigned proposes to perform the Work, furnish all materials and complete the Work in its entirety in the manner and under the conditions required in the Bid Documents at the prices listed as below. BY SUBMITTING THIS BID THE UNDERSIGNED ACKNOWLEDGES AND AGREES ON BEHALF OF THE BIDDER THAT, as per Section 01 2000 Sec. 2.01(B) for Contingency based Work, costs of overhead and profit and related administration, bond, coordination, insurance and superintendence shall be included in the Lump Sum(s) indicated on this Bid Form. Markups and costs for such items shall not be allowed or included in calculating change orders funded out of the Contingency.

1. **Base Bid Price** Lump Sum price for all of the work shown and specified in the Contract Documents and described in Division 00 through Division 14, Division 31 through Division 33, inclusive of any related work in Division 21 through Division 27, plans, and/or specifications that require General Construction Work and Section 010100 – “Summary of Work”

(Amount) \$ _____

2. **Add Alternate #1** for the repair of seventy-five (75) linear feet of the existing stucco

(Amount) \$ _____

3. **TOTAL BID PRICE = SUM OF ITEMS 1 AND 2** (Amount) \$ _____

TOTAL BID PRICE IN WORDS _____

Amount shall be shown in both words and figures where indicated. In case of discrepancy, the amount shown in words shall govern.

The Award will be made to the Lowest Responsive and Responsible Bidder based upon Item #3, TOTAL BID PRICE if Owner elects to include Alternate #1. If the Owner elects not to include Alternate #1, the Award will be made to the Lowest Responsive and Responsible Bidder based upon Item #1.

PART 5 – CERTIFICATION

The complete Bid shall include the following completed documents:

- a. Bid Form – Section 00 3000
- b. Bid Bond – Section 00 4100
- c. Stockholder & Partnership Affidavit – Section 00 4300
- d. Non-Collusion Affidavit – Section 00 4800
- e. Contractors Qualifications Statement – Section 00 4900
- f. Disclosure of Prior Non-Responsibility Determinations – Section 00 4950
- g. Iran Divestment Act Certification – Section 00 4951
- h. Corporate Resolution and Seal
- i. Certificate of Authority to do business in New York
- j. Copy of Acknowledgement of the Addenda

The undersigned agrees that extra work or omitted work, if any, shall be performed as directed and will be paid for, in accordance with the Contract Documents.

The individual submitting this Bid on behalf of the business entity noted above, certifies under the penalties of perjury by his or her signature below that:

- that this Bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this section, the word "person" shall mean any natural person, joint venture, partnership, corporation, or other business or legal entity;
- he or she is able to furnish labor that can work in harmony with all elements of labor employed or to be employed on the work;
- he or she has read and understood the full Request for Bid;
- he or she is duly authorized to submit the Bid on behalf of the business entity;
- he or she understands and has complied with the requirements of State Finance Law Sections 139-j and 139-k and will continue to do so throughout the Restricted Period; and
- that the business entity submitting this bid, and in the case of a joint bid each party as to its own organization, has and has implemented a written policy addressing sexual harassment prevention in the workplace and provides annual sexual harassment prevention training to all of its employees. Such policy shall, at a minimum, meet the requirements of Section 201-g of the New York State Labor Law.

(Signature of Individual or Corporate Name)

(Date)

(Signature of Corporate Officer – if applicable)

PART 6 – NOTICE

Notices regarding this Bid should be mailed or delivered to:

(Name)

(Title)

(Business Name)

(Business Address)

(City and State)

END OF SECTION 003000

SECTION 004100

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we,

hereinafter referred to as the "Principal", and

hereinafter referred to as the "Surety" are held and firmly bound to THE VILLAGE OF WOODBURY, NEW YORK, hereinafter referred to as the "VILLAGE", or to its successors and assigns in the penal sum of

Dollars (\$_____), lawful money of the United States, for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to submit (or has submitted) to the VILLAGE the accompanying proposal, hereby made a part hereof, to enter into a contract in writing for:

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall not withdraw said Proposal without the consent of the VILLAGE for a period of forty-five (45) days after the opening of bids and in the event of acceptance of the Principal's Proposal by the VILLAGE, if the Principal shall:

- (a) Within ten (10) days after notification by the VILLAGE, execute the number of multiples provided by the VILLAGE and deliver to the VILLAGE all the executed counterparts of the Contract in the form set forth in the Contract Documents, in accordance with the proposal as accepted, and
- (b) Furnish a performance bond and separate payment bond, as may be required by the VILLAGE for the faithful performance and proper fulfillment of such Contract, which bonds shall be satisfactory in all respects to the VILLAGE and shall be executed by good and sufficient sureties, and
- (c) In all respects perform the agreement created by the acceptance of said Proposal as provided in the Instructions to Bidders, bound herewith and made a part hereof, or if the VILLAGE shall reject the aforesaid Proposal, then this obligation shall be null and void; otherwise to remain in full force and effect.

In the event that the Proposal of the Principal shall be accepted and the Contract be awarded to Principal the Surety hereunder agrees subject only to the payment by the Principal of the premium therefore, if requested by the VILLAGE, to write the aforementioned performance and payment bonds in the form set forth in the Contract Documents.

It is expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

There shall be no liability under this bond if, in the event of the acceptance of the Principal's Proposal by the VILLAGE, either a performance bond or payment bond, or both, shall not be required by the VILLAGE on or before the 30th day after the date on which the VILLAGE signs the Contract.

The surety, for the value received, hereby stipulates and agrees that the obligations of the Surety and its bond shall in no way be impaired or affected by any postponements of the date upon which the VILLAGE will receive or open bids, or by an extensions of time within which the VILLAGE may accept the Principal's Proposal, or by any waiver by the VILLAGE of any of the requirements of the Instructions to Bidders, and the Surety hereby waives notice of any such postponements, extensions, or waivers.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this _____ day of _____, _____.

(Seal)

_____(L.S.)
Principal

By: _____

(Seal)

_____(L.S.)
Surety

By: _____

If the Principal is a partnership, the bond should be signed by each of the individuals who are partners.

If the Principal is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

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) certified copy of latest published financial statement of assets and liabilities of Surety.

AFFIX ACKNOWLEDGMENTS AND JUSTIFICATION OF SURETIES.

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

State of _____

County of _____ ss:

On this ____ day of _____, _____, before me personally came to me known, _____ who, being by me duly sworn, did depose and say that he/she is the _____ of _____

the corporation described in and which executed the foregoing instrument; that he/she knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he/she signed his/her name thereto by like order.

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

State of _____

County of _____ ss:

On this ____ day of _____, _____, before me personally appeared _____ to me known and known to me to be one of the members of the firm of _____ described in and who executed the foregoing instrument, and he/she acknowledged to me that he/she executed the same as and for the act and deed of said firm.

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of _____

County of _____ ss:

On this ____ day of _____, _____, before me personally appeared _____ to me known and known to me to be the person described in and who executed the foregoing instrument and acknowledged that he/she executed the same.

Notary Public

END OF SECTION 004100

SECTION 004300

STOCKHOLDER, MEMBERSHIP AND PARTNERSHIP INTEREST AFFIDAVIT

STATE OF _____

COUNTY OF _____

(Name) (Title)
of the firm of _____
(Firm Name)

being sworn according to law on his or her oath deposes and says that:

I am duly authorized to make this affidavit on behalf of the firm named herein.

The following are the names and addresses of all stockholders, members or partners in the corporation, limited liability company (LLC) or partnership who own ten percent (10%) or more of its stock of any class, ten percent (10%) or more interest therein, or of all individual partners in the partnership who own a ten percent (10%) or greater interest therein. If one or more such stockholders, members or partners is itself a corporation, LLC or partnership, the stockholders holding ten percent (10%) or greater interest in the corporation's stock, the members having ten percent (10%) or greater interest, or the individual partners owning ten percent (10%) or greater interest in the partnership that shall also be listed accordingly. This disclosure shall include names and addresses of every non-corporate stockholder, member and individual partner, exceeding the ten percent (10%) ownership criteria.

I hereby certify that the following is the complete list (attach additional sheets as necessary) of all stockholders, members and/or partners in the corporation(s)/LLC(s)/partnership(s) with ten percent (10%) or greater interest therein as set forth above.

By: _____
Title: _____

Notary Public

Subscribed and sworn to before me
This ____ day of _____, 20__

END OF SECTION 004300

SECTION 004800

NON-COLLUSIVE AFFIDAVIT

(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 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 bidder, 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;
- (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 in 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 made for the purpose of restricting competition.

The fact that a bidder (a) has published price lists, rates, or tariffs covering items being procured, (b) has informed prospective customers of proposed or pending publication of new or revised price lists for such items, or (c) has sold the same items to other customers at the same prices being bid, does not constitute, without more, a disclosure within the meaning of subparagraph one (a).

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, and where such bid contains the certification referred to in subdivision one of this section, shall be deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of the certificate as to non-collusion as the act and deed of the corporation.

COMPANY NAME

SIGNATURE

DATE

PRINT NAME

PRINT TITLE

END OF SECTION 004800

SECTION 004900

CONTRACTOR'S QUALIFICATION STATEMENT

Please complete in full, typed or in ink. Attach additional pages or supporting documentation as necessary for all questions. Both this questionnaire and the Disclosure of Prior Non-Responsibility Determinations **MUST** be completed.

1. Company Name: _____

Address of Principal Place of Business:

Street: _____

City, State, Zip: _____

Telephone: _____ Fax: _____

Name of Authorized Contact for this questionnaire: _____

Title: _____ Phone: _____

Email: _____ Fax: _____

2. Former or Other DBA or Trade Name(s), Other Identities, or EIN(s) used in the Past Five (5) Years (Include Business Entity Type, Name, EIN, State or County where filed and indicate active or inactive status. Attach additional pages as necessary):

3. Business Entity Type: _____

Date of Incorporation / Registration / Establishment: _____

If sole proprietorship, years in Business: _____

If general partnership, County formed in (if formed in NY): _____

State Business Entity was formed in, if other than NY: _____

If your business entity is other than a sole proprietorship or general partnership, is it registered to do business in NY? Yes No

Is your business entity a joint venture? Yes No

(If yes, separate Qualifications Statements must be submitted for each entity in the joint venture).

4. Company Resources

4.1 What services does your company provide?

4.2 How many full-time, permanent staff does your firm employ? _____

4.3 What is the average number of employees for the past five (5) years?

2016____ 2017____ 2018____ 2019____ 2020____

4.4 What services does the Company intend to self-perform on this Project?

4.5 What services does the Company intend to subcontract on this Project?

5. Identify each person who is, or has been within the past five (5) years, a Business Entity Official or Principal Owner of 5.0% or more of the entity's shares or one of the five largest shareholders or an officer, a director, partner or proprietor. Joint Ventures provide information for all firms involved.

Name: _____

Title: _____

Percentage Ownership: _____

Employment Status: Current Former

License(s) or Professional Registration(s) at time employed: _____

Name: _____
Title: _____
Percentage Ownership: _____
Employment Status: Current Former
License(s) or Professional Registration(s) at time employed: _____

Name: _____
Title: _____
Percentage Ownership: _____
Employment Status: Current Former
License(s) or Professional Registration(s) at time employed: _____

Name: _____
Title: _____
Percentage Ownership: _____
Employment Status: Current Former
License(s) or Professional Registration(s) at time employed: _____

Name: _____
Title: _____
Percentage Ownership: _____
Employment Status: Current Former
License(s) or Professional Registration(s) at time employed: _____

6. Name(s) and Relationships of Parent Company, Affiliates, Subsidiaries, Partners, include any other entities in which now, or in the past five years, the responding entity or any of the individuals listed in Question 5 either owned 5.0% or more of the shares of or was or is one of the five largest shareholders or an officer or a director, partner or proprietor.

Company _____
Address _____
City, State, Zip _____
Relationship _____

Company _____
Address _____
City, State, Zip _____
Relationship _____

Company _____
Address _____
City, State, Zip _____
Relationship _____

6.1 If a parent company or limited partnership exists, are there any guarantees? Please describe:

7. Financial Status

7.1 Provide a summary of your firm's annual revenues for the past five (5) years and a copy of the annual financial statement for the last year.

7.2 Dun & Bradstreet Number (or equivalent rating): _____

7.3 Banking References

Name of Bank _____
Address: _____
City, State, Zip: _____
Bank Officer: _____

Name of Bank: _____
Address: _____
City, State, Zip: _____
Bank Officer: _____

Name of Bank: _____
Address: _____
City, State, Zip: _____
Bank Officer: _____

7.3 Bonding Information:

Bonding Company: _____
Address: _____
City, State, Zip: _____
Agent Name and Phone Number: _____
Number of years with bonding company: _____
What is the Business Entity's bonding capacity?
Single Project: _____ Aggregate (all projects): _____

7.4 Federal Tax ID Number: _____

7.5 Has there been a change of ownership in the Company within the last three (3) years?

Yes _____ No _____

7.6 During the past seven (7) years, has the Company had any final judgments issued against it with respect to any claim? If yes, provide details:

7.7 During the past seven (7) years, has the Company ever filed for protection under the Federal bankruptcy laws? If yes, provide details.

7.8 Is the Business Entity a certified Minority Owned Business Enterprise, Women Owned Business Enterprise or Disadvantaged Business Enterprise (indicate certifying agency or entity):

8. Extent of Insurance Coverage

8.1 Describe the ability of the Company to comply with 29 CFR 1910.120 and OSHA.

8.2 List the Company's Experience Modification Rate (EMR) for the three (3) most recent years:

Year	Intrastate - NY	Interstate
2018	<hr/>	<hr/>
2017	<hr/>	<hr/>
2016	<hr/>	<hr/>

8.3 List the names, address and telephone numbers for verification of EMR's.

8.4 If the Company does not have an EMR, please explain.

8.5 How long has the Company been covered by its current provider of Worker Compensation Insurance?

8.6 Provide the following information from the Company's OSHA 200 logs. Attach the OSHA 200 logs for the company for the past five (5) years.

	2016	2017	2018	2019	2020
(a) Number of Lost Workday Cases	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
(b) Number of Restricted Workday Cases	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
(c) Number of Medical Treatment Cases	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

(not first aid)

(d) Employee Hours Worked Each Year

(e) Total Recordable Frequency Rate

8.7 List any fatalities your Company has had in the last three (3) years. Include location, cause and corrective action.

9. Geographic Operating Areas

10. Experience/Work History

10.1 List the ten most recent construction contracts the Business Entity has COMPLETED. If less than ten, include most recent completed subcontracts on projects up to that number. Include the following information on this list:

- Name of Client
- Client Contact Name and Phone Number
- Name of Project
- Award Date
- Completion Date
- Contract Amount
- Architect or Design Engineer
- Joint Venture name, if applicable
- Indicate if Prime or Subcontractor
- Description of Project – (Include specific details describing the scope and complexity for each project and how that experience is relevant to this project.)

10.2 List ALL current INCOMPLETE construction contracts held by the Business Entity. Include the following information on this list:

- Name of Client
- Client Contact Name and Phone Number
- Name of Project
- Award Date
- Scheduled Completion Date
- Architect or Design Engineer
- Joint Venture name, if applicable
- Indicate if Prime or Subcontractor
- Total Contract Amount
- Amount Subcontracted to Others

- Incompleted Amount
- Description of Project – (Describe the scope and complexity for each project and how that may impact your resources or ability to meet the proposed schedule on this Project.)

10.3 Within the past five (5) years, has the Business Entity, predecessor or affiliate:

a) ever had a contract terminated, suspended, cancelled or been declared in default or breach within the past five (5) years? Yes No If yes, provide details.

b) been a party in a lawsuit or other dispute resolution proceeding, including, without limitation, administrative proceedings or arbitration, within the past five (5) years?
Yes No If yes, provide details.

c) had any judgment or awards against it in the past five (5) years, including specific performance, restitution, or formal monitoring agreements?
Yes No If yes, provide details.

d) been suspended or debarred from any government contract process, been disqualified on any government procurement, or agreed to any voluntary exclusion from bidding or contracting with a government entity? Yes No If yes, provide details.

e) initiated a request to withdraw a bid submitted to a government entity or made any claim of error on a bid submitted to a government entity? Yes No If yes, provide details.

f) ever has a surety called upon to complete any contract whether government or private sector?
Yes No If yes, provide details.

g) had a revocation or suspension of any business or professional permit and/or license?
Yes No If yes, provide details.

h) had a denial, decertification, revocation or forfeiture of a Minority Owned Business Enterprise, Women Owned Business Enterprise or Disadvantaged Business Enterprise certification for other than a change of ownership?
Yes No If yes, provide details.

i) been the subject of a criminal investigation, whether open or closed, or an indictment for any business related conduct constituting a crime under federal, state or local law?
Yes No If yes, provide details.

j) been the subject of an indictment, grant of immunity, judgment or conviction (including entering into a plea bargain) for conduct constituting a crime?
Yes No If yes, provide details.

k) been the subject of any criminal investigation, felony indictment or conviction concerning the formation of, or any business association with, an allegedly false or fraudulent Minority Owned Business Enterprise, Women Owned Business Enterprise or Disadvantaged Business Enterprise?
Yes No If yes, provide details.

l) had a government entity find a willful prevailing wage or supplemental payment violation?

Yes No If yes, provide details.

m) entered into a consent order with the New York State Department of Environmental Conservation, or a federal, state or local government enforcement determination involving violation of federal, state or local environmental laws?

Yes No If yes, provide details.

n) other than disclosed elsewhere in this Qualifications Statement, been the subject of any citations, notices of violations, pending administrative hearings or proceedings or determinations of a violation of:

- i) federal, state or local health laws, rules or regulations? Yes No
- ii) federal, state or local environmental laws, rules or regulations? Yes No
- iii) federal, state or local human rights laws? Yes No
- iv) federal, state or local security laws? Yes No
- v) unemployment insurance or workers compensation coverage or claim requirements?
Yes No
- vi) Employee Retirement Income Security Act (ERISA)? Yes No

If yes to any of the above, provide details.

o) had any liquidated damages assessed over \$25,000? Yes No

If yes, provide details.

n) had any liens, claims or judgments (not including UCC filings, over \$25,000 which remain undischarged or were unsatisfied for more than 90 days?

Yes No If yes, provide details.

10.4 Within the past five (5) years, has any individual previously identified above or any Individual having the authority to sign, execute or approve bids, proposals, contracts or supporting documentation with governmental entities been subject to:

a) a sanction imposed relative to any business or professional license?

Yes No If yes, provide details.

b) a criminal investigation, whether open or closed, or an indictment for any business-related conduct constituting a crime under federal, state or local law?

Yes No If yes, provide details.

c) any misdemeanor or felony charge, indictment or conviction for:

- i) any business-related activity including but not limited to fraud, coercion, extortion, bribe or bribe-receiving, giving or accepting unlawful gratuities, immigration or tax fraud, racketeering, mail fraud, wire fraud, price fixing or collusive bidding?; or
- ii) any crime, whether or not business-related, the underlying conduct of which related to truthfulness, including but not limited to the filing of false documents or false sworn statements, perjury or larceny?

Yes No If yes, provide details.

d) a debarment from any government contracting process? Yes No

If yes, provide details.

11. Health and Safety Program

11.1 Does the Company have an official Health and Safety Department? Yes No

11.2 Provide a copy of the organization chart for the Company's health and safety department and resumes of key individuals.

11.3 Attach list of any State or Federal Health and Safety citation received in the past three (3) years.

11.4 Would you provide us with a copy of your Corporate Health and Safety Plan/Program if asked?
Yes No

11.5 Are accident reports (OSHA 200) circulated to:

		Monthly	Qtrly	Annually
Employees?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supervisors and/or foreman?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vice President/General Manager?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
President Owner of the Firm?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11.6 Indicate the number of employees by labor category who have undergone OSHA 1910.20 health and safety measures and provide the types of programs and procedures the Company adheres to:

	Labor Category	Number of Employees
Health & Safety Training	_____	_____
Medical Monitoring	_____	_____

11.7 Does the Company conduct field safety inspections? Yes No

If yes, who conducts the inspection (include title) _____

If so, how often? ☐ Weekly ☐ Bi-Weekly ☐ Monthly ☐ As Needed

11.8 During foreman performance reviews, does the Company use safety as a criterion for rating purposes? Yes No

11.9 Does the Company hold tailgate or tool box safety meetings? Yes No

If so, how often? ☐ Weekly ☐ Bi-Weekly ☐ Monthly ☐ As Needed

11.10 Does the Company have a pre-job employee and new hire safety orientation program? Yes No

If yes, does it include instructions on the following:

	Yes	Hrs*	No
Company Safety Policy	_____	_____	_____
Company safety rules, procedures	_____	_____	_____

free at each job site.

meetings for

the following instructions:

Yes Hrs* No

ed to each new foreman.

11.12 How are accident records and accident summaries kept? How often are they reported?

	Yes	No	Monthly	Annually
Accidents totaled for the entire company	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accidents related to the Project	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accidents totaled by Project	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11.13 How are the costs of individual accidents kept? How often are they reported?

	Yes	No	Monthly	Annually
Costs totaled for entire company	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Costs totaled for projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11.14 List any OSHA citations and resolutions during the past three (3) years.

11.15 List any OSHA citations and resolutions during the past three (3) years for any of the Company's proposed major subcontractors.

11.16 Does the Company have a drug/alcohol program? Yes No

11.17 Does the Company have a safety recognition program? Yes No

12. Quality Assurance/Quality Control Program

12.1 Does the Company have an official Quality Assurance/Quality Control (QA/QC) Department?

12.2 Who is the Department Head and to whom does this person report?

12.3 Does the Company have a formal Quality Assurance/Quality Control (QA/QC) Manual or Procedure?
Yes No

12.4 Would the Company provide us with a copy of its Corporate Quality Assurance/Quality Control Manual if asked? Yes No

12.5 What type of QA/QC training does your Company provide for its employees?

12.6 Indicate compliance with industry codes and standards and attach a copy of code authorization sheet

(ASME, IEEE, AJSC, ANSI, etc.)

13. Additional Information

Attach any additional information which would assist the Owner and its agents to evaluate the Company's qualifications, history, financial standing, safety record, and insurability as it relates to a project of similar scope, complexity, and size to this Project.

14. Indicate whether any information provided herein is believed to be exempt from disclosure under the Freedom of Information Law (FOIL). Note: A determination of whether such information is exempt from FOIL will be made at the time of any request for disclosure under FOIL.

Yes No Indicate question number(s) and basis for FOIL exemption, attaching additional pages as necessary.

15. Certification and Signature of Authorized Representative:

The undersigned: (1) recognizes that this questionnaire is submitted for the express purpose of assisting the Village of Woodbury in making responsibility determinations regarding an award of a contract or approval of a subcontract; (2) recognizes that the Village of Woodbury will rely on information disclosed herein in making responsibility determinations in approving a contract or subcontract; (3) acknowledges that the Village of Woodbury may, in its discretion, by means which it may choose, verify the truth and accuracy of all statements made herein; and (4) acknowledges that intentional submission of false or misleading information may constitute a misdemeanor or felony under New York State Penal Law, may be punishable by a fine and/or imprisonment under Federal Law, and may result in a finding of non-responsibility, contract suspension or contract termination.

The undersigned certifies that he or she:

- is knowledgeable about the submitting Business Entity's business and operations;
- has read and understands all of the questions contained herein;
- has not altered the content of this questionnaire in any manner;
- has reviewed and/or supplied full and complete responses to each question;
- to the best of his or her knowledge, information and belief, confirms that the Business Entity's responses are true accurate and complete, including all attachments, if applicable;
- understands that the Village of Woodbury will rely on the information disclosed herein when entering into a contract with the Business Entity; and
- is under obligation to update the information provided herein to include any material changes to the responses at the time of the bid submission through the contract award notification, and may be required to update the information at the request of the Village prior to the award and/or approval of a contract, or during the term of the contract.

Name of Business Entity: _____

Signature: _____

Name: _____

Title: _____

Notary Public

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

END OF SECTION 004900

SECTION 004950

DISCLOSURE OF PRIOR NON-RESPONSIBILITY DETERMINATIONS

See instructions on next page before completing this form.

Name of Individual or Entity Seeking to Enter into the Procurement Contract:

Address: _____

Name and Title of Person Submitting this Form: _____

1. Has any Governmental Entity made a finding of non-responsibility regarding the individual or entity seeking to enter into the Procurement Contract in the previous four years? No Yes

If Yes, please answer the next questions:

2. Was the basis for the finding of non-responsibility due to a violation of State Finance Law §139-j?

No Yes

3. Was the basis for the finding of non-responsibility due to the intentional provision of false or incomplete information to a Governmental Entity? No Yes

4. If you answered yes to any of the above questions, please provide details regarding the finding of non-responsibility below and attach additional pages as necessary.

Governmental Entity: _____

Date of Finding of Non-responsibility: _____

Basis of Finding of Non-responsibility: _____

5. Has any Governmental Entity or other governmental agency terminated or withheld a Procurement Contract with the above names individual or entity due to the intentional provision of false or incomplete information?

No Yes

6. If yes, please provide details below and attach additional pages as necessary.

Governmental Entity: _____

Date of Termination or Withholding of Contract: _____

Basis of Termination or Withholding: _____

Offeror certifies that all information provided to the Governmental Entity with respect to State Finance Law §139-k is complete, true and accurate.

By: _____ Date: _____

Signature

Instructions for Completing the Bidder Disclosure of Prior Non-Responsibility Determinations

Background:

New York State Finance Law §139-k(2) obligates a Governmental Entity to obtain specific information regarding prior non-responsibility determinations with respect to State Finance Law §139-j. This information must be collected in addition to the information that is separately obtained pursuant to State Finance Law §163(9). In accordance with State Finance Law §139-k, an Offeror must be asked to disclose whether there has been a finding of non-responsibility made within the previous four (4) years by any Governmental Entity due to: (a) a violation of State Finance Law §139-j or (b) the intentional provisions of false or incomplete information to a Governmental Entity. The terms "Offeror" and "Governmental Entity" are defined in State Finance Law §139-k(1). State Finance Law §139-j sets forth detailed requirements about the restrictions on Contacts during the procurement process. A violation of State Finance Law §139-j includes, but is not limited to, an impermissible Contact during the restricted period (for example, contacting a person or entity other than the designated contact person, when such contact does not fall within one of the exemptions).

As part of its responsibility determination, State Finance Law §139-k(3) mandates consideration of whether an Offeror fails to timely disclose accurate or complete information regarding the above non-responsibility determination. In accordance with law, no Procurement Contract shall be awarded to any Offeror that fails to timely disclose accurate or complete information under this section, unless a finding is made that the award of the Procurement Contract to the Offeror is necessary to protect public property or public health safety, and that the Offeror is the only source capable of supplying the required Article of Procurement within the necessary timeframe. See State Finance Law §§139-j(10)(b) and 139-k(3).

Instructions:

The Village of Woodbury includes this disclosure request regarding prior non-responsibility determinations in accordance with State Finance Law §139-k in its solicitation of proposals or bid documents or specifications or contract documents, as applicable, for procurement contracts. The attached form is to be completed and submitted by the individual or entity seeking to enter into a Procurement Contract, Supplemental or Change Order. It shall be submitted with your Bid to the Village agency conducting the Governmental Procurement.

This document must accompany each Bid Form, Letter of Interest, or Proposal submitted by all Offerors.

END OF SECTION 004950

SECTION 004951

IRAN DIVESTMENT ACT CERTIFICATION

The Iran Divestment Act of 2012 ("Act"), Chapter 1 of the 2012 Laws of New York, added State Finance Law (SFL), §165-a and General Municipal Law §103-g, effective April 12, 2012. Under the Act, the Commissioner of the New York State Office of General Services ("OGS") developed a list ("Prohibited Entities List") of "persons" who are engaged in "investment activities in Iran" (both are defined terms in the law). In accordance with SFL § 165-a(3), the Prohibited Entities List may be found on the OGS website at:

<http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf>.

Pursuant to General Municipal Law §103-g, by signing below, Bidder certifies as true under the penalties of perjury that:

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 its knowledge and belief that each Bidder is not on the list created pursuant to paragraph (b) of subdivision 3 of section 165-a of the State Finance Law.

A Bid shall not be considered for award nor shall any award be made where the certification has not been made, provided, however, that if in any case the Bidder cannot make the certification, the Bidder shall so state and shall furnish with the Bid a signed statement which sets forth in detail the reasons therefor. The Village may award a contract to a Bidder who cannot make the required certification on a case-by-case basis if:

- (1) The investment activities in Iran were made before April 12, 2012, the investment activities in Iran have not been expanded or renewed after April 12, 2012, and the person has adopted, publicized, and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or
- (2) The Village makes a determination that the goods and services are necessary for the Village to perform its functions and that, absent such an exemption, the political subdivision would be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

During the term of the Contract, should the Village receive information that a person is in violation of the above-referenced certifications, the Village will offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment which is in violation of the Act within 90 days after the determination of such violation, then the Village shall take such action as may be appropriate including, but not limited to, imposing sanctions, seeking compliance, recovering damages, or declaring the contractor in default.

The Village reserves the right to reject any bid, proposal, contract or request for assignment for an entity that appears on the Prohibited Entities List prior to the award or execution of a contract or any renewal thereof, as applicable, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities List after contract award.

BUSINESS NAME

NAME

TITLE

SIGNATURE

DATE

END OF SECTION 004951

SAMPLE PUBLIC IMPROVEMENT CONTRACT

THIS AGREEMENT ("Contract") entered into and effective Month/Day, 20____ between Woodbury, a village of the State of New York, by and through its Village Clerk having its principal office at 455 Route 32, Highland Mills, NY 10930 ("Owner"), and Contractor's Name a State of Registration business entity type e.g. sole proprietorship having its principal office at principal business address, if different than service address add "with services to be performed from offices at address" ("Contractor"),

WITNESSETH: That Owner and Contractor, for the promises and consideration set forth herein, agree as follows:

1. CONTRACT DOCUMENTS & DEFINITIONS. The Contract Documents are defined in §1.1(3) of Division 01 Section 010000 - General Conditions ("General Conditions") and shall include all properly executed Contract modifications. Definitions of terms of art in this Public Improvement Contract (e.g. Contract Documents, Work, Project, etc.) are as in §1.1 of the General Conditions, unless otherwise indicated herein.

2. WORK TO BE DONE. Contractor, at its cost and expense, shall furnish all materials, appliances, tools, and labor of every kind required by the Contract Documents including Bid Alternative(s) ####/name and will complete and finish the Work in the most workmanlike manner in strict compliance with the Contract Documents, for the price of:

Dollars (\$###.##)

("Contract Sum"). Should the amount of Work be increased or decreased due to special conditions encountered in the Work, or where ordered by the Owner, the Contractor agrees that the basis of compensation for such increase or decrease shall be by Unit Bid Prices or as otherwise agreed upon pursuant to §7 of this Contract.

3. EXAMINATION OF DOCUMENTS AND SITE. Contractor agrees that before making its bid, it carefully examined the Contract Documents, together with the Work Site and is fully informed regarding all of the conditions affecting the Work to be done and the labor and materials to be furnished for the completion of this Contract. Contractor shall secure, at its cost and expense, all applicable and necessary permits from applicable authorities having jurisdiction required in connection with the Work.

4. TIME OF COMPLETION. Contractor shall begin the Work in accordance with Table 1-1 of the General Conditions, unless the written consent of the Owner is given to begin at a later date. Time is of the essence and Contractor will prosecute the Work without interruption, so that it will be entirely completed and performed by in accordance with Table 1-1 of the General Conditions, unless the time is extended by written change order at the sole discretion of the Owner.

5. LIQUIDATED DAMAGES FOR DELAY. The parties recognize and agree that time is of the essence and the Work shall be accomplished within the time stated in §4 of this Contract. Since actual damages are speculative in nature and not readily ascertainable, liquidated damages shall apply if Contractor is unable to achieve substantial completion by the date agreed upon and through no fault of the Owner, its officers, employees and/or other contractors. Should the Work, including any previously approved change orders, not be substantially completed within the time specified and, unless an extension of time has been granted by the Owner, the Contractor shall forfeit the sum of **One Thousand Dollars (\$1,000.00) per Day**, for each and every Day from and after the time during which the Work, including any approved change orders, shall remain unfinished and incomplete. The forfeited sum(s) shall be deemed Liquidated Damages and shall be deducted from the sum agreed to be paid to

the Contractor by the Owner under the terms of this Contract or any binding addendum and/or change order. This provision shall not be construed as a penalty.

6. PERFORMANCE. The Work under this Contract is to be done to the satisfaction of the Owner and all materials shall be subject to Owner's acceptance.

7. CHANGES IN THE WORK AND CLAIMS FOR EXTRA WORK. To the extent permissible under New York State Law, and in accordance with Division 01 Section 010000 - General Conditions §1.41, Owner reserves the right to order extra Work, or make changes by altering, adding to, or deducting from the Work without invalidating the Contract. The Contract Sum shall be increased or decreased by any one of the following mutually agreeable methods, to the extent any are legally applicable:

- 7.1** Using the Unit Price Bid;
- 7.2** Negotiated Lump Sum price; or
- 7.3** Negotiated Time and Material price.

Any claims for extension of time caused by changes shall be stated in writing and shall be subject to Owner approval.

8. DEDUCTIONS. Owner shall make an equitable deduction from the Contract Sum for any uncorrected Work or Work not done in accordance with the Specifications. In addition, Owner shall deduct contingency or other amounts required to close out the Contract upon completion of the Work.

9. PAYMENT.

9.1 Contractor shall adhere to all provisions of New York State Labor Law regarding certified payrolls. With each requisition, Contractor shall submit a certified payroll of the amount paid for wages and applicable supplements for all employees. Certified payrolls shall be submitted for all employees of the Contractor and any Subcontractor(s) utilized by the Contractor. In addition, Owner reserves the right to require Contractor to submit with any requisition a detailed statement of all materials utilized and paid for by Contractor.

9.2 The Owner will audit each month and pay such amount, as the Owner certifies has been earned by Contractor, less Five (5) percent retainage which will be paid to Contractor upon completion of the Work.

9.3 Upon the faithful performance and full completion of the Work and within Thirty (30) Days after acceptance by Owner, Owner will pay to Contractor the remaining amount of the Contract Sum, (taking into account any additions or deductions) less the total of all previous payments. The acceptance by the Contractor of the Final Payment shall be and operate as a release to the Owner of all claims and liability to the Contractor for all things done or furnished in connection with this Work and for every act and neglect of the Owner, and others relating to or arising out of this Work, excepting the Contractor's claim for interest upon the final payment, if this payment be improperly delayed. No payment, however, final or otherwise, shall operate to release the Contractor or Contractor's sureties from any obligations under this Contract or the Performance or Payment Bonds.

10. LABOR LAW COMPLIANCE.

10.1 Pursuant to New York State Labor Law 220(2), no laborer, worker or mechanic in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or a part of the Work shall be permitted or required to work more than eight hours in any One (1) Calendar Day or more than Five (5) 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 (8) hours in any Day or more than Five (5) Days in any One (1) week except in such emergency. Extraordinary emergency within the meaning of this §10 shall be deemed to include situations in which sufficient laborers, workers and mechanics cannot be employed to carry on public work expeditiously as a result of such restrictions upon the number of hours and Days of labor and the immediate commencement or prosecution or completion without undue delay of the public work is necessary in the judgment of the New York State Commissioner of Labor ("Labor Commissioner") for the preservation of the Contract Site and for the protection of the life and limb of the persons using the same. Upon the application of any person interested, the Labor Commissioner shall make a determination as to whether or not on any public project or on all public projects in any area of this state, sufficient laborers, workers and mechanics of any or all classifications can be employed to carry on Work expeditiously if their labor is restricted to Eight (8) hours per Day and Five (5) Days per week, and in the event that the Labor Commissioner determines that there are not sufficient workers, laborers and mechanics of any or all classifications which may be employed to carry on such Work expeditiously if their labor is restricted to Eight (8) hours per Day and Five (5) Days per week, and the immediate commencement or prosecution or completion without undue delay of the public work is necessary in the judgment of the Labor Commissioner for the preservation of the Project Site and for the protection of the life and limb of the persons using the same, the Labor Commissioner shall grant a dispensation permitting all laborers, workers and mechanics, or any classification of such laborers, workers and mechanics, to work such additional hours or Days per week on such public project or in such areas the Labor Commissioner shall determine. Whenever such a dispensation is granted, all Work in excess of Eight (8) hours per Day and Five (5) Days per week shall be considered overtime Work, and the laborers, workers and mechanics performing such Work shall be paid a premium wage commensurate with the premium wages prevailing in the area in which the Work is performed. No such dispensation shall be effective with respect to any public work unless and until the Owner certifies to the Labor Commissioner that such Project is of an important nature and that a delay in carrying it to completion would result in serious disadvantage to the public. 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.

10.2 Pursuant to New York State Labor Law 220(3)(a) each laborer, workman or mechanic, employed by Contractor, any Subcontractor(s) or other person on this Project shall be paid not less than the prevailing rate of wages and supplements set by the New York State Department of Labor.

10.3 Pursuant to New York State Labor Law 220(3)(d)(iv), the filing of payrolls in a manner consistent with Labor Law 220(3-a) is a condition precedent to payment of any sums due and owing for Work done upon the Project.

10.4 Pursuant to Labor Law 220-d, the prevailing wage rate and supplement schedule was specified in the Contract Documents. Laborers, workingmen or mechanics shall be paid not less than such prevailing wage rates and supplements.

10.5 Pursuant to Labor Law 220-e, Contractor and every Subcontractor agrees:

10.5.1 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 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;

10.5.2 that no Contractor, Subcontractor, nor any person on his 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, disability, sex or national origin;

10.5.3 that there may be deducted from the amount payable to Contractor by the Owner under this Contract a penalty of fifty dollars (\$50.00) for each person for each Calendar Day during which such person was discriminated against or intimidated in violation of the provisions of the Contract;

10.5.4 that this Contract may be cancelled or terminated by New York State or the Owner, 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 §10 of the Contract; and

10.5.5 the aforesaid provisions covering every Contract for or on behalf of New York State or the Owner 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.

10.6 Pursuant to Labor Law 220-h, if the Contract Sum of this Contract is at least two hundred fifty thousand dollars (\$250,000) all laborers, workers, and mechanics employed in the performance of the contract on the Project Site, either by Contractor, any Subcontractor(s) or other person doing or contracting to do the whole or a part of the Work contemplated by the Contract, shall be certified prior to performing any Work on the Project as having successfully completed a course in construction safety and health approved by the United States Department of Labor's Occupational Safety and Health Administration that is at least ten (10) hours in duration.

10.7 Pursuant to Labor Law 222(2)(d), the design of this Project shall be subject to the review and approval of Owner and Contractor shall furnish performance and payment bonds as specified in the Contract Documents, which shall conform to the provisions of New York State, Owner and applicable local law, and that a copy of such performance and payment bonds shall be kept by Owner and shall be open to public inspection.

10.8 Pursuant to Labor Law 222(2)(e), Owner shall consider the financial and organizational capacity of contractors and subcontractors in relation to the magnitude of Work they may perform, the record of performance of contractors and Subcontractors on previous Work, the record of contractors and subcontractors in complying with existing labor standards and maintaining harmonious labor relations, and the commitment of contractors to Work with minority and women-owned business enterprises pursuant to Article 15-A of the New York State Executive Law through joint ventures of subcontractor relationships. If the Contract Sum of this Contract is in excess of five hundred thousand dollars (\$500,000), Contractor and any Subcontractor shall participate in apprentice training programs in the trades of work it employs that have been approved by the New York State Department of Labor for not less than three (3) years and shall have graduated at least one apprentice in the last three (3) years and shall have at least one (1)

apprentice currently enrolled in such apprenticeship training program. In addition, it must be demonstrated that the program has made significant efforts to attract and retain minority apprentices, as determined by affirmative action goals established for such program by the New York State Department of Labor.

10.9 Pursuant to Labor Law 222-a, in the construction of public works wherein a harmful dust hazard is created for which appliances or methods for the elimination of harmful dust have been approved by the Industrial Board of Appeals, the installation, maintenance and effective operation of such appliances and methods is required. Failure to comply with this provision shall void this Contract.

11. POSTING. Contractor and all Subcontractors, if any, engaged in the Work described in this Contract shall post and maintain at each of their establishments and at the Work Site(s), any and all notices required of employers by federal and New York State laws and regulations, as may be amended.

12. BONDS. Contractor shall procure and deliver bonds to Owner and maintain them at Contractor's cost and expense, until final acceptance by Owner of the Work covered by this Contract. Types and amounts of Bonds shall be as specified in the Instructions to Bidders.

13. PROCUREMENT OF AGREEMENT.

13.1 Contractor represents and warrants that no person or selling agency has been employed or retained by Contractor to solicit or secure this Contract upon an agreement or upon an understanding for a commission, percentage, a brokerage fee, contingent fee or any other compensation. Contractor further represents and warrants that no payment, gift or thing of value has been made, given or promised to obtain this or any other agreement between the parties. Contractor makes such representations and warranties to induce the Owner to enter into this Contract and the Owner relies upon such representations and warranties in the execution hereof.

13.2 For a breach or violation of such representations or warranties, the Owner shall have the right to annul this Contract without liability, entitling the Owner to recover all monies paid hereunder and Contractor shall not make claim or be entitled to recover, any sum or sums otherwise due under this Contract. This remedy, if effected, shall not constitute the sole remedy afforded the Owner for such falsity or breach, nor shall it constitute a waiver of the Owner's right to claim damages or otherwise refuse payment or to take any other action provided for by law, in equity or pursuant to this Contract.

14. CONFLICT OF INTEREST.

14.1 Contractor represents and warrants that neither it, nor any of its officers, directors, partners, members, employees, contractors, agents, assignees or other representatives, have any interest nor shall they acquire any interest, directly or indirectly, which would or may conflict in any manner or degree with the performance of this Contract. Contractor further represents and warrants that no person having such conflict of interest or possible conflict of interest shall be employed or contracted by it unless such person:

14.1.1 if required by the Owner's "**Code of Ethics**" (Village Code Chapter 39) to submit a Disclosure Form to the Village Owner Board of Ethics, amends such Disclosure Form to include their interest in this Contract; or

14.1.2 if not required to complete and submit such a Disclosure Form, must either voluntarily complete and submit a Disclosure Form disclosing their interest in this Contract or seek a formal opinion from the Village Owner Ethics Board as to whether or not a conflict of interest exists.

14.2 For a breach or violation of such representations or warranties, Owner shall have the right to annul this Contract without liability, entitling Owner to recover all monies paid hereunder and Contractor shall not make claim to, or be entitled to recover, any sum(s) otherwise due under this Contract. This remedy, if effected, shall not constitute the sole remedy afforded Owner, nor shall it constitute a waiver of Owner's right to claim damages, or otherwise refuse payment, or to take any other action provided for by law, in equity or pursuant to this Contract.

14.3 The foregoing provisions shall not limit Owner's rights under the Local Ethics Law with regard to civil penalties or criminal prosecution as provided in the Local Ethics Law.

15. CURRENT OR FORMER OWNER EMPLOYEES.

15.1 Contractor represents and warrants that it shall not retain the services of any Owner employee or former Owner employee in connection with this Contract or any other Contract that Contractor has or may have with the Owner, without the express written permission of the Owner. This limitation period covers the preceding three (3) years or longer if the Owner employee or former Owner employee has or may have an actual or perceived conflict of interest(s) due to their position with Owner.

15.2 For a breach or violation of such representations or warranties, Owner shall have the right to annul this Contract without liability, entitling Owner to recover all monies paid hereunder and Contractor shall not make claim for or be entitled to recover, any sum or sums otherwise due under this Contract. This remedy, if affected, shall not constitute the sole remedy afforded Owner for such falsity or breach, nor shall it constitute a waiver of Owner's right to claim damages or otherwise refuse payment or to take any other action provided for by law or pursuant to this Contract.

16. INDEPENDENT CONTRACTOR.

16.1 In performing the Work and incurring expenses under this Contract, Contractor shall operate as, and have the status of, an independent contractor and shall not act as agent, or be an agent, of Owner. As an independent contractor, Contractor shall be solely responsible for determining the means and methods of performing the Work and shall have complete charge and responsibility for Contractor's personnel and subcontractors engaged in the performance of the same.

16.2 In accordance with such status as independent contractor, Contractor covenants and agrees that neither it nor its employees or agents will hold themselves out as, nor claim to be officers or employees of Owner, or of any department, agency or unit thereof, and that they will not make any claim, demand or application to or for any right or privilege applicable to an officer or employee of Owner including, but not limited to, Worker's Compensation and Disability, health insurance, Unemployment Insurance Benefits, Social Security coverage or employee retirement membership or credit.

17. ASSIGNMENT.

17.1 Pursuant to New York State General Municipal Law §109, Contractor shall not assign, transfer, convey, sublet or otherwise dispose of any of its rights, title or interests in this Contract, or its power to execute this Contract, without the prior express written consent of the Village Executive, or his or her designee. If Contractor assigns, transfers, conveys, sublets or otherwise disposes of its rights, title or interests in this Contract, or its power to execute it without such consent, Owner shall revoke and annul this Contract and Owner shall be discharged from any and all liability and obligations growing out of this Contract to Contractor and to any party to which such assignment, transfer, conveyance, sublet or other disposition was purportedly made. Contractor shall also forfeit and lose all moneys theretofore earned under this Contract, except so much as may be required to pay its employees performing under this Contract. The provisions of this clause shall not hinder, prevent, or affect any assignment by Contractor for the benefit of its creditors made pursuant to the laws of the State of New York.

17.2 This Contract may be assigned by Owner to any corporation, agency, municipality or instrumentality having authority to accept such assignment.

18. SUBCONTRACTORS.

18.1 Contractor shall submit in writing to the Owner a list of all Subcontractors, if any, whom Contractor shall engage for the Work prior to awarding any subcontracts. The Contractor shall not employ any Subcontractor to whom Owner may have a reasonable objection nor shall Contractor be required to employ any Subcontractor against whom Contractor has a reasonable objection. Contractor may not discharge and/or replace any Subcontractors without Owner's written approval. Contractor shall contractually require every Subcontractors' compliance with the terms of this Contract, as far as applicable to each Subcontractor's Work, and shall assume full responsibility to Owner for acts and omissions of Subcontractors. There shall be no contractual relation between Owner and any Subcontractor, and in no way shall Owner be obligated to pay any sums to any Subcontractor. At the completion of the Work, and before final payment shall be made, Contractor shall submit to Owner lien releases or notarized statements from any and all Subcontractors that full payment was received.

18.2 Contractor agrees not to enter into any subcontracts for the performance of its obligations, in whole or in part, under this Contract, without the prior written approval of the Owner. A copy of any proposed subcontract(s) shall be submitted to the Owner with Contractor's written request for approval. All such subcontracts shall contain provisions specifying:

18.2.1 That the work performed by the subcontractor must be in accordance with this Contract;

18.2.2 That nothing contained in the subcontract shall impair the rights of the Owner;

18.2.3 That nothing contained in this subcontract or under this Contract shall create any contractual relation in law or equity between the subcontractor and the Owner; and

18.2.4 Any terms, conditions, forms or other provisions that may be required by New York State or federal provisions specified in or incorporated by reference into this Contract, as applicable.

18.3 Contractor agrees that it is fully responsible to Owner for the acts and omissions of its subcontractors, and of persons either directly or indirectly employed by its subcontractors, to the same extent as Contractor is responsible for acts and omissions employed by Contractor.

18.4 Contractor shall not in any way be relieved of any responsibility under this Contract by any subcontract.

19. IDENTIFYING INFORMATION AND PRIVACY NOTIFICATION.

19.1 Identification Number(s). For granting, renewing, amending, supplementing or restating the license of any person, and for every invoice or other claim for payment submitted to Owner by Contractor under this Contract, the application, invoice or claim must include Contractor's payee identification number. This number is any or all of the following:

19.1.1 the payee's federal employer identification number;

19.1.2 the payee's federal social security number, and/or

19.1.3 the payee's Contractor Identification Number assigned by Owner, if any.

19.2 Failure to include applicable payee identification number(s), as required by Owner, may delay payment. Where Contractor does not have such number(s), on its application, invoice or other claim for payment, Contractor must give the reason or reasons why it does not have a payee identification number(s).

19.2 Privacy Notification.

19.2.1 The Owner's authority to request the above personal information from Contractor, and its authority to maintain such information, is found in New York State Tax Law §5. Disclosure of this information by Contractor to Owner is mandatory. The principal purpose for collection of the information is for New York State to identify individuals, businesses and others who have been delinquent in filing tax returns, or may have understated their tax liabilities, and to generally identify persons affected by the taxes administered by the New York State Commissioner of Taxation and Finance. The information will be used for tax administration purposes and for any other purpose authorized by law.

19.2.2 The Owner may forward the personal information to the New York State Commissioner of Taxation and Finance upon that Commissioner's request pursuant to New York State Tax Law §5(3).

20. RECORDKEEPING. Contractor agrees to maintain separate and accurate books, records, documents and other evidence and accounting procedures and practices which sufficiently and properly reflect all direct and indirect costs of any nature expended in the performance of this Contract.

21. RETENTION OF RECORDS. Contractor agrees to retain all paper and electronic invoices, payment receipts, books, records and other data and documents relevant to this Contract ("**Records**") for six (6) years after the final

payment or termination of this Contract or such longer period as may be required the Contract Documents or by law or regulation, whichever later occurs. Owner, or any state and/or federal auditors, and any other persons duly authorized by Owner, shall have full access and the right to examine any records during the term of this Contract and the retention period, unless otherwise specified in schedule a or required by law or regulation.

22. AUDIT BY THE OWNER AND OTHERS. All records and accounts upon which the records are based are subject to inspection, review and audit by the Owner, New York State, United States, and/or other persons or entities duly authorized by Owner. Contractor, upon request, shall submit any and all documentation and justification in support of expenditures or fees under this Contract as may be required for evaluation of the reasonableness of the charges. Such audits may include examination and review of the source and application of all funds relevant to the performance of the Work, whether from the Owner, New York State, the federal government, private sources or otherwise. Contractor shall not be entitled to any interim or final payment under this Contract if any audit requirements and/or requests have not been satisfactorily met.

23. SAFETY OF PERSONS AND PROPERTY.

23.1 Contractor assumes the risk of and shall be responsible for, any loss or damage to Owner property, including property and equipment leased by the Owner, used in the performance of this Contract and caused, either directly or indirectly by the acts, conduct, omissions or lack of good faith of Contractor, its officers, directors, members, partners, employees, contractors, agents, assignees, or other representatives.

23.2 To the fullest extent permitted by law, Contractor agrees to defend, indemnify and hold the Owner and Architect/Engineer harmless from any and all claims, liabilities, expenses, costs, losses, damage or causes of action (including, without limitation, reasonable attorneys' fees and costs of litigation and/or settlement) arising out of, directly or indirectly, the services performed and/or the goods and materials provided pursuant to this Contract.

23.3 In the event that any Owner property is lost, damaged (except for normal wear and tear), or destroyed, then Owner shall have the right to withhold payments for the purposes of set-off in sufficient sums to cover such loss or damage. This remedy, if effected, shall not constitute the sole or exclusive remedy afforded Owner, nor shall it constitute a waiver of that Owner's right to claim damages or otherwise refuse payment or to take any other action provided for by law, in equity or pursuant to this Contract.

23.4 Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to:

23.4.1 employees on the Work and other persons who may be affected thereby including, but not limited to, the Owner, Subcontractors, other contractors, Suppliers, delivery persons or other third parties;

23.4.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site, under care, custody or control of Contractor or Subcontractors;

23.4.3 other property at the Work Site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction; and

23.4.4 construction by Owner, Subcontractors or other contractors.

23.5 Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

23.6 Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

23.7 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

23.8 Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in §23.4.1 through §23.4.4 caused in whole or in part by the Contractor, Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under §23.4.1 through §23.4.4 caused, except damage or loss attributable to acts or omissions of the Owner or anyone directly or indirectly employed by it, or by anyone for whose acts Owner may be liable.

23.9 Contractor shall designate a responsible member of Contractor's organization at the Work Site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to Owner.

23.10 Contractor shall not load or permit any part of the construction or Work Site to be loaded so as to endanger its safety.

23.11 Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner, other Subcontractors or separate contractors caused by the Contractor's or any of its Subcontractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

24. INSURANCE.

24.1 Prior to commencing performance of the Work, Contractor shall obtain and maintain in full force and effect during the term of this Contract, and any renewal or modification thereof, at its expense, insurance coverage of the types and, at minimum, in the coverage limits listed below. Such policies are to be in the broadest form available on usual commercial terms and shall be written by insurers with an A.M. Best rating of A- or better and satisfactory to Owner, who have been fully informed as to the nature of the Work to be performed and any modification(s) thereto. This insurance shall cover the premises on operations of the Contractor and shall cover all Subcontractors. Policies for insurance must be written as

to include contingent liability and contingent property damage insurance to protect Contractor against claims arising from the operations of Subcontractors. Owner may require Contractor to secure miscellaneous property insurance, elevator insurance or other forms of indemnity protection depending upon the Work to be performed. Additional coverage types or limits may be required by Owner if any policy contains a contractual liability exclusion. Policies must protect the Contractor, Subcontractors (as defined in the General Conditions), Owner, and Architect/Engineer from any and all claims which may arise out of or result from the Contractor's or any Subcontractor's performance under the Contract and for which the Contractor or Subcontractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

24.2 The insurance required hereunder shall be written for not less than the following amounts, or greater, if required by law:

24.2.1 Workers Compensation & Disability: State Statutory Amounts

24.2.2 Employer's Liability: \$1,000,000 aggregate and each occurrence

24.2.3 Commercial General Liability (including Premises; Independent Contractor's Protective; Bodily Injury; Property Damage; Contractual Liability; and Products and Completed Operations to be maintained for two years after Final Payment): \$1,000,000 aggregate and each occurrence

24.2.4 Business Automobile Liability with: \$1,000,000 aggregate and each occurrence

24.2.5 Contractors Pollution Liability: \$1,000,000 aggregate and each occurrence

24.2.6 Umbrella Excess Liability: \$3,000,000, aggregate and each occurrence which may be used to fund any portion of the insurances required above.

24.3 Coverage listed in this Article 24, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of Final Payment and termination of any coverage required to be maintained after Final Payment. Claims-made policies shall be maintained for three (3) years from the date of Final Payment.

24.4 Contractor and Subcontractors (through Contractor), within Ten (10) Days of the date of issuance of Notice of Intent to Award, shall supply the Owner with a Certificate(s) of Insurance, evidencing compliance with the minimum requirements listed above and shall within Thirty (30) Days thereafter furnish Owner with certified copies of the policies. The certificates and the insurance policies required by this §24.4 shall contain a provision that coverage will not be canceled or allowed to expire until at least Thirty (30) Days prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after Final Payment, an additional certificate evidencing continuation of such coverage shall be submitted with the Final Application for Payment as required by the Contract Documents. Information concerning reduction of coverage on account of revised limits or claims paid under occurrence, aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

24.5 With the exception of Workers Compensation, Disability and Professional Liability, Contractors and Subcontractors shall have the Owner and Architect/Engineer each added as an additional insured to all policies. The insurance policies shall be endorsed to indicate that they are primary as respects the Owner and Architect/Engineer of record and not contributory with any other insurance available to either of those parties. Each policy shall contain the following cross liability provision.

"In the event of a claim being made hereunder by one insured for which another insured is or may be liable, then this policy shall cover such insured against whom a claim is or may be made in the same manner as if separate policies had been issued to each insured hereunder."

24.6 Waivers of Subrogation: Each Contractor and Subcontractor waives all claims, losses, damages, or expenses against the Owner, Architect/Engineer, Contractor, the other Subcontractors and each of their respective officers, directors, members, partners, subcontractors, subconsultants, agents, and employees, as applicable, from risks actually insured. Insurance policies shall provide such waivers of subrogation by endorsement or otherwise.

24.7 In accordance with New York State General Municipal Law §108 this Contract shall be void and of no effect unless the person or corporation making or performing such Contract shall secure compensation for the benefit of, and keep insured during the life of such Contract, such employees, in compliance with the provisions of the New York State Workers' Compensation Law.

24.8 The Contractor shall not commence Work unless and until all required certificates have been submitted to and accepted by the Owner. Acceptance by the Owner of a certificate hereunder does not excuse the Contractor from securing a policy consistent with all provisions of this Article or of any liability arising from its failure to do so.

24.9 The Contractor shall be responsible for providing continuous insurance coverage in the manner, form and limits required by this Contract and shall be authorized to perform Work only during the effective period of all required coverage.

24.10 In the event that any of the required insurance policies lapse, are revoked, suspended or otherwise terminated, for whatever cause, the Contractor shall immediately stop all Work, and shall not recommence Work until authorized in writing to do so by the Owner. Upon quitting the Site, except as otherwise directed by the Owner, the Contractor shall leave all plant, materials, equipment, tools and supplies on the Site. Contract time shall continue to run during such periods, no extensions of time shall be granted, and Contractor shall be liable for any delays to the Project incurred by Owner or by other Contractors to their Work. The Owner may also declare the Contractor in default for failure to maintain required insurance.

25. WORKER'S COMPENSATION AND DISABILITY INSURANCE. Pursuant to General Municipal Law §108, this Contract shall be void and of no effect unless Contractor and each Subcontractor, if any, shall secure compensation for the benefit of, and keep insured during the life of this Contract, such employees, in compliance with the provisions of the Worker's Compensation Law, unless Contractor is exempt and provides the applicable New York State Workers Compensation Board certificate of exemption.

26. UNEMPLOYMENT BENEFITS. Contractor shall take out and maintain during the life of this Contract adequate unemployment benefits insurance, in compliance with New York Labor Law Article 18, for all employees and will also require all Subcontractors, if any, to maintain such insurance.

27. INDEMNIFICATION.

27.1 To the fullest extent permitted by law, Contractor shall defend, indemnify and hold harmless Owner and its officers, employees, contractors, agents, assignees and other representatives, from and against any and all claims, liabilities, expenses, costs, losses, damages and causes of action (including without limitation, reasonable attorneys' fees and costs of litigation and/or settlement) arising out of, directly or indirectly, the services performed and/or goods provided pursuant to this Contract.

27.2 Without limiting the foregoing, to the fullest extent permitted by law, Contractor specifically agrees to defend, indemnify and hold Owner harmless against claims, including claims by Contractor's customers and/or subcontractors, based on infringement of copyright, patent, trade secret, trademark, libel, slander, or invasion of privacy, arising out of, directly or indirectly, the services performed and/or goods provided by Contractor or its officers, directors, partners, members, employees, contractors, agents, assignees or other representatives pursuant to this Contract.

27.3 In the event that any claim is made or any action is brought against Owner arising out of, in connection with or otherwise relating to this Contract either within or without the scope of Contractor's duties, obligations or applicable industry standards, or those of any of Contractor's respective officers, directors, partners, members, employees, contractors, agents, or other representative's; then Owner shall have the right to withhold further payments hereunder, for the purpose of set-off, in sufficient sums to cover the claims, liabilities, expenses, costs, losses, damages or causes of action. This remedy, if effected, shall not constitute the sole or exclusive remedy afforded the Owner, nor shall it constitute a waiver of that the Owner's right to claim damages or otherwise refuse payment or to take any other action provided for by law, in equity, or pursuant to this Contract.

28. WARRANTY.

28.1 The Contractor warrants to the Owner that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

28.2 Contractor warrants to Owner that all construction and related services provided hereunder shall be performed in a good and workmanlike manner, by workers who are appropriately trained and experienced in the Work being performed, and in accordance with all requirements of the Contract Documents, industry standards for projects of similar type and quality, and all applicable laws, codes, regulations and other requirements, including safety requirements.

28.3 If, within one (1) year after the date of Final Completion of the Work or designated portion thereof, any of the Work is found to be not in accordance with the requirements of the Contract Documents, regardless of prior acceptance by Owner, the Contractor shall correct it promptly, after receipt of written notice from the Owner to do so. Owner shall give such notice promptly after actual discovery of the condition. This period of one (1) year shall be extended with respect to portions of the Work first performed

after completion of the Work by the period of time between completion and the actual performance of that portion of the Work. This obligation under this §28.3 shall survive acceptance of the Work and expiration or earlier termination of this Contract.

28.4 The warranty in §28.3 is separate from the warranties in §28.1 and §28.2 and shall not be construed as a period of limitation on the warranties under §28.1 and §28.2.

29. SUSPENSION OR TERMINATION OF THE CONTRACT.

29.1 Termination by the Contractor

29.1.1 Contractor may terminate the Contract if the Work is stopped for a period of ninety (90) consecutive Days through no act or fault of Contractor or its Subcontractor(s) or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with Contractor, for any of the following reasons:

- .1** issuance of an order of a court or other authority having jurisdiction over the Work or parties hereto which requires all Work to be stopped; or
- .2** an act of government, such as a declaration of national emergency which requires all Work to be stopped;

29.1.2 Contractor may terminate the Contract if; through no act or fault of Contractor or its Subcontractor(s) or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with Contractor; repeated suspensions, delays or interruptions of the Work by Owner as described §29.0 constitute in the aggregate more than One Hundred (100) percent of the total number of Days scheduled for completion, or One Hundred Twenty (120) Days in any successive Three Hundred Sixty-Five (365)-Day period commencing from the start date of the Contract, whichever is less.

29.1.3 In case of such termination, Contractor shall be entitled to receive payment for Work executed in accordance with the Contract Documents.

29.2 Termination by the Owner for Cause

29.2.1 Contractor shall be deemed in default, and Owner may terminate this Contract, if Contractor, or any of its Subcontractors, shall:

- .1** fail to begin Work within the time specified;
- .2** persistently or repeatedly refuse or fail to supply sufficient properly skilled workers or sufficient proper equipment or materials to insure the completion of the Work within the specified time as reasonably determined by Owner, which failure shall not be cured within Ten (10) Days after notice from Owner;
- .3** perform the Work in a manner reasonably deemed by Owner to be unsatisfactory, which failure shall not be cured within Ten (10) Days after notice from Owner;

- .4** fail or refuse to remove materials reasonably determined by Owner to be unsuitable, which failure shall not be cured within Ten (10) Days after notice from Owner;
- .5** fail or refuse to perform anew any Work reasonably determined by Owner to be defective or unacceptable, which failure shall not be cured within Ten (10) Days after notice from Owner;
- .6** fail to diligently proceed with the prosecution of the Work according to the agreed schedule for completion, which failure shall not be cured within Ten (10) Days after notice from Owner;
- .7** fail to make prompt payment to Subcontractors or Suppliers for labor or material furnished to or for the Work, which failure shall not be cured within Ten (10) Days after notice from Owner;
- .8** become insolvent or be declared bankrupt, commit any act of bankruptcy or insolvency, or make an assignment for the benefit of creditors;
- .9** violate any laws, ordinances, rules, regulations or orders of any authority having jurisdiction over the Work or the Project, which violation shall not be cured within Ten (10) Days after notice from Owner;
- .10** otherwise fail to perform its obligations hereunder, which failure shall not be cured within Thirty (30) Days after notice from the Owner; or
- .11** pursuant to New York State Finance Law §139-k(5) upon finding by Owner that the information and certification provided by Contractor in the Disclosure of Prior Non-Responsibility Determinations is intentionally false or intentionally incomplete.

29.2.2 When Owner determines that any of the above reasons exist, Owner may, without prejudice to any other rights or remedies Owner may have, and after giving Contractor and Contractor's surety, if any, Seven (7) Days written notice:

- .1** terminate the Contract;
- .2** take possession of the Site and of all materials, equipment, tools, construction equipment and machinery thereon owned by Contractor;
- .3** finish the Work by whatever method Owner, in its sole discretion may deem expedient; and
- .4** provide Contractor with instructions as described in §29.2.3.

29.2.3 Upon receipt of notice of termination, Contractor shall immediately, in accordance with written instructions from Owner, proceed with performance of the following duties regardless of delay in determining or adjusting amounts due under this §29.2:

- .1 cease operations as specified in the notice;
- .2 place no further orders and enter into no further subcontracts for materials, equipment, labor, services or facilities, except as necessary to complete continued portions of the Contract;
- .3 promptly make every reasonable effort to procure cancellation upon terms satisfactory to Owner of all orders and subcontracts;
- .4 take actions that may be necessary, or that Owner may direct, for the protection and preservation of the terminated Work and to protect materials, plant and equipment on the Work Site or in transit thereto; and
- .5 execute and deliver such papers and documents and take such steps, including legal assignment of its contractual rights, as Owner may require in order to vest in Owner the rights and benefits Contractor may have under any obligations or commitments incurred or undertaken by Contractor in connection with the Work.

29.2.4 In the event that Owner terminates this Contract under §29.2, Contractor shall not be entitled to receive further payment until the Work is finished. If the sum of the costs of finishing the Work; including compensation for the services, as applicable to this Contract, of Architect/Engineer, its consultants, Subcontractors, and any other contractors made necessary thereby; plus the amounts previously paid to Contractor prior to termination, exceed the Contract Sum, Contractor shall pay the difference to the Owner upon demand. If the foregoing costs together with all other costs incurred by Owner as a consequence of having to terminate the Contract are less than the Contract Sum, then upon completion of the Work, Contractor shall be paid the portion of such difference, if any, properly allocable to the portion of the Work completed by Contractor prior to termination by the Owner, and for which Contractor has not previously been paid. In no event, however, shall Contractor be entitled to receive more than the difference between the Contract Sum, minus all costs associated with completing the Work and terminating the employment of Contractor. In determining the amount owing to Contractor, allowances shall be made for claims which Owner has against Contractor under the Contract, and for the value of materials, supplies, equipment and other items that are part of the Cost of the Work to be disposed of by Contractor.

29.2.5 By terminating the employment of Contractor, Owner does not forfeit the right to recover damages from Contractor.

29.3 Suspension by the Owner for Convenience

29.3.1 Owner may, without cause, order Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as Owner may determine.

29.3.2 The Contract Sum and term shall be adjusted for increases in the cost and time caused by suspension, delay or interruption pursuant to bed in §29.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

- .1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

29.4 Termination by the Owner for Convenience

29.4.1 Owner may, at any time, terminate the Contract for Owner's convenience and without cause.

29.4.2 Upon receipt of written notice from Owner of such termination for Owner's convenience, the Contractor shall:

- .1 cease operations as directed by Owner in the notice;
- .2 place no further orders and enter into no further subcontracts for materials, equipment, labor, services or facilities, except as necessary to complete continued portions of the Contract;
- .3 promptly make every reasonable effort to procure cancellation upon terms satisfactory to Owner of all orders and subcontracts;
- .4 take actions that may be necessary, or that Owner may direct, for the protection and preservation of the terminated Work and to protect materials, plant and equipment on the Work Site or in transit thereto; and
- .5 execute and deliver such papers and documents and take such steps, including legal assignment of its contractual rights, as Owner may require in order to vest in Owner the rights and benefits Contractor may have under any obligations or commitments incurred or undertaken by Contractor in connection with the Work.

29.4.3 In case of such termination for Owner's convenience, Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on Work not executed.

30. CLOSEOUT PROCEDURES.

Upon the expiration or earlier termination of this Contract, Contractor shall comply with any and all Owner closeout procedures, including, but not limited to:

- 30.1** Accounting for and refunding to Owner within Thirty (30) Days, any unexpended funds which have been paid to Contractor pursuant to this Contract; and

30.2 Furnishing within Thirty (30) Days an inventory to Owner of all equipment, appurtenances and property purchased by Contractor through or provided under this Contract and carrying out any Owner directive concerning the disposition thereof.

31. NONDISCRIMINATION; EQUAL EMPLOYMENT OPPORTUNITIES.

31.1 To the extent required by Article 15 of the New York State Executive Law (also known as the Human Rights Law) and all other New York State and federal statutory and constitutional non-discrimination provisions, Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, sex (including gender identity or expression), national origin, sexual orientation, military status, age, disability, predisposing genetic characteristics, marital status or domestic violence victim status.

31.2 Furthermore, in accordance with §220-e of the New York State Labor Law, if the Work for this Contract includes construction, alteration or repair of any public building or public work or for the manufacture, sale or distribution of materials, equipment or supplies, and to the extent that this Contract shall be performed within New York State, Contractor agrees that neither it nor its Subcontractors shall, by reason of race, creed, color, disability, sex, or national origin:

31.2.1 discriminate in hiring against any New York State citizen who is qualified and available to perform the work; or

31.2.2 discriminate against or intimidate any employee hired for the performance of the Work under this Contract.

31.3 If this is a building service contract as defined in §230 of the Labor Law, then, in accordance with §239 thereof, Contractor agrees that neither it nor its Subcontractors shall by reason of race, creed, color, national origin, age, sex or disability:

31.3.1 discriminate in hiring against any New York State citizen who is qualified and available to perform the work; or

31.3.2 discriminate against or intimidate any employee hired for the performance of work under this contract.

31.4 Contractor is subject to fines of \$50.00 per person per Day for any violation of §220-e or §239 of New York State Labor Law, as well as possible termination of this Contract and forfeiture of all moneys due hereunder for a second or subsequent violation. These remedies, if effected, shall not constitute the sole or exclusive remedies afforded the Owner, nor shall it constitute a waiver of that the Owner's right to claim damages or otherwise refuse payment or to take any other action provided for by law, in equity, or pursuant to this Contract.

31.5 If this Contract involves the sale or rental of property, Contractor specifically agrees to abide by all applicable provisions of federal and state laws and regulations, as applicable to sale or rental of the property. With respect to any sale of the property and selection and treatment of tenants, Contractor shall not in any manner discriminate on the basis of race, color, religion, sex (including gender identity or

expression), familial status, national origin, disability, age, sexual orientation, military status or marital status.

32. SECULAR PURPOSE.

32.1 Contractor agrees that no funds received pursuant to this Contract will be used for sectarian purposes or to further the advancement of any religion.

32.2 Additionally, Contractor agrees that if it is, or is deemed to be, a religious or denominational institution or organization, or an organization operated for religious purposes which is supervised or controlled by, or in connection with, a religious or denominational institution or organization, in performing this Contract Contractor will:

32.2.1 not discriminate against any employee or applicant for employment on the basis of religion, and will not limit or give preference in employment to persons on the basis of religion;

32.2.2 not discriminate against any individual or entity, seeking to participate or participating in any program or activity funded under this Contract and will not limit the programs and activities or give preference to persons, on the basis of religion; and

32.2.3 provide no religious instruction or counseling, conduct no religious worship or services, engage in no religious proselytizing and exert no other religious influence in the provision of services or the use of facilities or furnishings funded in whole or in part under this Contract or any other agreement with Owner.

33. PROHIBITION ON PURCHASE OF TROPICAL HARDWOODS.

33.1 Contractor certifies and warrants that all wood products to be used in performing the Work under this Contract, if any, will be in accordance with, but not limited to, the specifications and provisions of New York State State Finance Law §165. (Use of Tropical Hardwoods) which prohibits purchase and use of tropical hardwoods, unless specifically exempted, by New York State or any governmental agency or political subdivision or public benefit corporation.

33.2 In addition, when any portion of this Contract involving the use of woods, whether supply or installation, is to be performed by any subcontractor, the Contractor will indicate and certify in the submitted bid or proposal that the subcontractor has been informed and is in compliance with specifications and provisions regarding use of tropical hardwoods as detailed in New York State State Finance Law §165.

33.3 Contractor certifies that any use of tropical hardwood in the Work meets with the exception requirements of New York State State Finance Law §165(2)(d)(iii), as established by the Contractor and was approved by Owner during the quote, bid or proposal process.

34. COMPLIANCE WITH NEW YORK STATE INFORMATION SECURITY BREACH NOTIFICATION ACT.

Both during and after the performance of the Work under this Contract, with respect to all data involved in the performance of this Contract, Contractor shall comply with the New York State Information Security Breach and Notification Act (General Business Law §899-aa; State Technology Law §208, both as may be amended).

35. COMPLIANCE WITH EXECUTIVE ORDER 38.

Contractor is and shall remain in compliance with New York State Executive Order 38 of 2013, as may be amended. More information may be found at: <http://www.executiveorder38.ny.gov/>.

35. COMPLIANCE WITH PROCUREMENT LOBBYING LAWS.

35.1 To the extent this Contract is a "procurement contract" as defined by New York State State Finance Law §139-j and §139-k, Contractor certifies and affirms that all disclosures made in accordance with New York State State Finance Law §139-j and §139-k are complete, true and accurate. In the event such certification is found to be intentionally false or incomplete, Owner may terminate this Contract in accordance with §29.2 of this Contract.

35.2 Notwithstanding any other provision of this Contract, Contractor shall not be relieved of liability to Owner for damages sustained by Owner by virtue of Contractor's breach of this §35. Owner may withhold payments to Contractor for the purposes of set-off until such time as the exact amount of damages due to Owner from Contractor is determined.

35.3 These remedies, if effected, shall not constitute the sole or exclusive remedies afforded the Owner, nor shall it constitute a waiver of that the Owner's right to claim damages or otherwise refuse payment or to take any other action provided for by law, in equity, or pursuant to this Contract.

36. COMPLIANCE WITH IRAN DIVESTMENT ACT.

36.1 Contractor certifies in accordance with New York State State Finance Law §165-a that it is not on the "Entities Determined to be Non-Responsive Bidders/Offerers pursuant to the New York State Iran Divestment Act of 2012" ("**Prohibited Entities List**") posted at:
<http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf>

36.2 Contractor agrees that should it seek to renew or extend this Contract, it must provide the same certification at the time this Contract is renewed or extended. Contractor also agrees that any proposed assignee of this Contract will be required to certify that it is not on the Prohibited Entities List before the assignment will be approved by Owner.

36.3 During the term of this Contract, should Owner receive information that Contractor is in violation of the above-referenced certifications, Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Iran Divestment Act (New York State State Finance Law §165-a) within Ninety (90) Days after the determination of such violation, then Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, imposing sanctions, seeking compliance, recovering damages, or declaring Contractor in default and terminating the Contract in accordance with §29.2 of this Contract. These remedies, if effected, shall not constitute the sole or exclusive remedies afforded the Owner, nor shall it constitute a waiver of that the Owner's right to

claim damages or otherwise refuse payment or to take any other action provided for by law, in equity, or pursuant to this Contract.

36.4 Owner reserves the right to reject any request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

37. RESERVED.

38. FORCE MAJEURE.

38.1 A Force Majeure occurrence is an event or effect that cannot be reasonably anticipated or controlled and is not due to the negligence or willful misconduct of the affected party. Force Majeure includes, but is not limited to, acts of God, acts of war, acts of public enemies, terrorism, strikes, fires, explosions, actions of the elements, floods, or other similar causes beyond the control of the Contractor or the Owner in the performance of this Contract where non-performance, by exercise of reasonable diligence, cannot be prevented.

38.2 The affected party shall provide the other party with written notice of any Force Majeure occurrence as soon as the delay is known and provide the other party with a written contingency plan to address the Force Majeure occurrence, including, but not limited to, specificity on quantities of materials, tooling, people, and other resources that will need to be redirected to another facility and the process of redirecting them. Furthermore, the affected party shall use its commercially reasonable efforts to resume proper performance within an appropriate period of time. Notwithstanding the foregoing, if the Force Majeure condition continues beyond Thirty (30) Days, the parties shall jointly decide on an appropriate course of action that will permit fulfillment of the parties' objectives hereunder.

38.3 The Contractor agrees that in the event of a delay or failure in the performance of the Work by Contractor, due to a Force Majeure occurrence, the Owner may purchase from other sources (without recourse to and by the Contractor for the costs and expenses thereof) to replace all or part of the goods and/or services which are the subject of the delay, which purchases may be deducted from the quantities of this Contract, if any, without penalty or liability to the Owner.

38.4 Neither the Contractor nor the Owner shall be liable to the other for any delay in or failure of performance under this Contract due to a Force Majeure occurrence. Any such delay in or failure of performance shall not constitute default or give rise to any liability for damages. The existence of such causes of such delay or failure shall extend the period for performance to such extent as determined by the Contractor and the Owner to be necessary to enable complete performance by the Contractor and Owner if reasonable diligence is exercised after the cause of delay or failure has been removed.

38.5 Notwithstanding the above, at the discretion of the Owner where the delay or failure will significantly impair the value of this Contract to the Owner, the Owner may terminate this Contract or the portion thereof which is subject to delays, and thereby discharge any unexecuted portion of this Contract or the relative part thereof.

39. GENERAL RELEASE.

The acceptance by Contractor or its assignees of the final payment under this Contract (whether based on invoice, judgment of any court of competent jurisdiction, administrative or any other means) shall constitute and operate as a general release to Owner from any and all claims of Contractor arising out of the performance of this Contract.

40. SET-OFF RIGHTS.

40.1 Owner shall have all of its common law, equitable and statutory rights of set-off. These rights shall include, but are not limited to, Owner's right to withhold for the purposes of set-off any monies otherwise due to Contractor:

40.1.1 under this Contract;

40.1.2 under any other agreement or contract with Owner, including any agreement or contract for a term commencing prior to or after the term of this Contract; or

40.1.3 from Owner by operation of law.

40.2 Owner also has the right to withhold any monies otherwise due under this Contract for the purposes of set-off as to any amounts due and owing to Owner for any reason whatsoever including, without limitation, tax delinquencies, fee delinquencies or monetary penalties or interest relative thereto.

41. DISPUTE RESOLUTION. Any and all disputes involving this Contract, including the breach or alleged breach thereof, may not be submitted to arbitration unless specifically agreed thereto in writing by the Owner Executive, or his or her designee, but must instead only be heard in the Supreme Court of the State of New York, with venue in Orange County or if appropriate, in the Federal District Court with venue in the Southern District of New York, White Plains division.

42. GOVERNING LAW. This Contract shall be governed by and construed in accordance with the laws of the State of New York, without giving effect to its conflicts of law principles.

43. BUSINESS AUTHORIZATION AND REGISTRATION; SERVICE OF PROCESS.

43.1 Contractor shall be properly authorized and registered to do business as required by the laws of the state of New York applicable to Contractor's business entity type.

43.2 Regardless of the propriety or legality of Contractor's business authorization and registration status, as a condition of contract, Contractor shall agree to service of process as follows: In addition to the methods of service allowed by New York's Civil Practice Law and Rules, Contractor consents to service of process upon it by registered or certified mail, return receipt requested, to the address indicated in this Contract. Service shall be complete upon Contractor's actual receipt of process, or upon Owner's receipt of the return by the United States Postal Service as refused or undeliverable. Contractor shall immediately notify Owner, in writing, via registered or certified mail, return receipt requested, of each change or address to which service of process can be made. Service by Owner to the last known address shall be sufficient.

44. NOTICE.

- 44.1** All notices permitted or required hereunder shall be in writing and shall be transmitted either:
- 44.1.1** via certified or registered United States mail, return receipt requested;
 - 44.1.2** by personal delivery;
 - 44.1.3** by overnight delivery service with a nationally recognized carrier (e.g. FedEx, UPS);
 - 44.1.4** by fax (only as explicitly designated and required by the Contract Documents and when other provisions of this Contract do not control over this §44); or
 - 44.1.5** by email (only as explicitly designated and required by the Contract Documents and when other provisions of this Contract do not control over this §44).

44.2 The parties agree to mutually designate individuals as their respective representative for the purposes of receiving notices under this Contract. Additional individuals may be designated in writing by the parties for purposes of implementation and administration/billing, resolving issues and problems, and/or for dispute resolution. Notices shall be addressed as follows or to such different addresses as the parties may from time to time designate in accordance with §44.2:

Owner

Name: Ms. Desiree Potvin,
Title: Village Clerk
Address: Village of Woodbury
455 Route 32
Highland Mills, NY 10930
Phone Number: (845) 928-7558 Fax: (845) 928-9278
Email: villageclerk@villageofwoodbury.com

Contractor

Name: insert name
Title: insert title
Address: insert mailing address
Phone Number: insert phone number
Fax: insert fax number
Email: insert email

44.3 Any such notice shall be deemed to have been given either at the time of personal delivery or, in the case of expedited delivery service or certified or registered United States mail, as of the date of first attempted delivery at the address and in the manner provided herein, or in the event of a Contract Document permits facsimile transmission or email notice but does not indicate when a notice takes effect, such notices shall be deemed given, upon receipt.

44.4 The parties may, from time to time, specify any new or different contact person or address in the United States as their address for purpose of receiving notice by notifying Owner, in writing, via registered or certified mail, return receipt requested, of each change or address.

45. SURVIVAL.

The rights and obligations under §§ 5, 8, 9, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 27, 28, 29, 30, 34, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51 and 53 shall survive the termination of this Contract.

46. MODIFICATION.

46.1 No modification(s) of this Contract shall be valid unless reduced to writing and signed by both parties. Changes in the scope of Work for this Contract shall not be binding, and no payment shall be due in connection therewith, unless prior to the performance of any additional Work, the Owner Executive, or his or her designee, after consultation with the Department Head, executes a modification to this Contract, which specifically sets forth the additional Work; the amount of compensation; and the extension of the time for performance, all as may be applicable to the change in the Work, at the Owner's discretion.

46.2 Unless otherwise specifically provided for in the modification(s), the provisions of this Contract shall remain in full force and effect and applicable to the modified scope of Work.

47. COMPLIANCE.

47.1 Contractor and its officers, directors, partners, members, employees, Subcontractors, agents, assignees, Suppliers or other representatives shall at all times comply with all applicable local, state and federal laws and regulations in the performance of the Work.

47.2 Contractor understands that it may be necessary for Owner to submit to governmental agencies or to a court of law part of or all of the data, analyses and/or conclusions developed in the performance of the Work as well as certification, payment applications or other documentation certified and/or signed by Contractor or its officers, directors, partners, members, employees, Subcontractors, agents, assignees, Suppliers, or other representatives. Contractor is aware that there are significant state and/or federal civil and criminal penalties for submitting false information, including the possibility of fines and imprisonment. Contractor is responsible for such penalties resulting from false information submitted by Contractor or its officers, directors, partners, members, employees, Subcontractors, agents, assignees, Suppliers or other representatives and shall, to the fullest extent permitted by law, defend, indemnify and hold harmless Owner and its officers, employees, contractors, agents, assignees and other representatives, from and against any and all claims, liabilities, expenses, costs, losses, damages and causes of action (including without limitation, reasonable attorneys' fees and costs of litigation and/or settlement) arising out of, directly or indirectly, any such submission of false information.

48. WAIVER. No covenant, condition or undertaking contained in this Contract may be waived except by the written agreement of the parties. Forbearance or indulgence in any form by either party in regards to any covenant, condition or undertaking to be kept or performed by the other party shall not constitute a waiver thereof, and until complete satisfaction or performance of all such covenants, conditions and undertakings, the other party may be entitled to invoke any remedy available under this Contract, despite any such forbearance or indulgence.

49. EXECUTORY CONTRACT. Owner shall have no liability under this Contract to Contractor or to anyone else beyond the extent of funds accepted and actually received by Owner from any funding source for this Contract and that are in turn appropriated and made available for this Contract by the Owner.

50. BINDING EFFECT. This Contract shall be binding upon the parties hereto and their respective successors and assigns.

51. SEVERABILITY. If any part, term or provision of this Contract is declared or found to be illegal, unenforceable, or void, then both parties shall be relieved of all obligations arising under such provisions, but the remainder of this Contract shall be interpreted so as to carry out the intent of the parties in an equitable manner.

52. ENTIRE AGREEMENT. This Contract sets forth the entire agreement between the Owner and Contractor with regard to the subject matter hereof, and supersedes all prior representations, agreements and understandings, written or oral and shall bind the successors, assigns, and representatives of the parties hereto.

53. NO DAMAGES FOR DELAY. Notwithstanding anything to the contrary in the Contract Documents, the Contractor agrees to make no claim for damages for delay, disruption, or hindrance in the performance of this contract occasioned by any act or omission to act by the Owner or LAN Associates or any of the representatives or agents of the Owner or LAN including, but not limited to, act or omissions relating to design and coordination, and agrees that any such claim shall be fully compensated for by an extension of time to complete performance of the work as provided herein, which shall be Contractor’s sole, exclusive and complete remedy in this regard.

IN WITNESS WHEREOF, the parties hereto have executed this Contract as of date above written. The undersigned each represent that he or she is dually authorized to sign this Agreement on behalf and bind the party he or she represents.

VILLAGE OF WOODBURY

CONTRACTOR

BY: _____
MS. DESIREE POTVIN
VILLAGE CLERK

BY: _____
Name: _____
Title: _____

VILLAGE ACKNOWLEDGMENT

STATE OF NEW YORK }
VILLAGE OF WOODBURY} :SS.

On this _____ day of _____, 20____, before me, the subscriber, personally came _____, to me known who, being by me duly sworn, did depose and say that she is the _____ of the Owner, the municipal corporation described in, and which executed, the above instrument; and that she was duly authorized to execute the same as the act and deed of the municipal corporation.

Notary Public

**CONTRACTOR ACKNOWLEDGMENT – USE INDIVIDUAL, PARTNERSHIP,
OR CORPORATE ACKNOWLEDGMENT, AS APPLICABLE**

(INDIVIDUAL ACKNOWLEDGMENT)

STATE OF NEW YORK }
VILLAGE OF WOODBURY} :SS.

On this _____ day of _____, 20__, before me, the subscriber, personally appeared _____ to me personally known, and known to me to be the same person described in, and who executed, the foregoing instrument, and he/she duly acknowledged to me that he/she was duly authorized to execute the same.

Notary Public

(PARTNERSHIP ACKNOWLEDGMENT)

STATE OF NEW YORK }
VILLAGE OF WOODBURY} :SS.

On this _____ day of _____, 20__ before me, the subscriber, personally appeared _____ to me personally known, and known to be a member of the partnership of _____ described in, and who executed the foregoing instrument, and he/she acknowledged to me that he/she was duly authorized to execute the same as the act and deed of the partnership.

Notary Public

(CORPORATE ACKNOWLEDGMENT)

STATE OF NEW YORK }
VILLAGE OF WOODBURY} :SS.

On this _____ day of _____, 20__, before me, the subscriber, personally appeared _____ to me personally known, who being by me duly sworn, did depose and say that he/she is the _____ of _____ the corporation described in the foregoing instrument; that he/she knows the seal of the corporation; the seal affixed to this instrument is the corporation seal; that it was so affixed by order of the Board of Directors of said corporation, and that he/she was duly authorized to execute the same as the act and deed of the corporation.

Notary Public

SECTION 006100A

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _____

hereinafter referred to as the "Principal", and _____

hereinafter referred to as the "Surety" are held and firmly bound to THE VILLAGE OF WOODBURY, NEW YORK,
hereinafter referred to as the "VILLAGE", or to its successors and assigns in the penal sum of _____

Dollars (\$_____), lawful money of the United States, for the payment of which said sum of money
well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and
assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to submit (or has submitted) to the VILLAGE the accompanying proposal, hereby
made a part hereof, to enter into a contract in writing for _____

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his, her or its representatives or
assigns, shall well and faithfully perform the said Contract and all modifications, amendments, additions and
alterations thereto that may hereafter be made, according to its terms and its true intent and meaning, including
repair and/or replacement of defective work and guarantees of maintenance for the periods stated in the Contract,
and shall fully indemnify and save harmless the VILLAGE from all cost and damage which it may suffer by reason of
failure so to do, and shall fully reimburse and repay the VILLAGE for all outlay and expense which the VILLAGE may
incur in making good any such default, and shall protect the said VILLAGE against, and pay any and all amounts,
damages, costs and judgments which may or shall be recovered against said VILLAGE or its officers or agents of
which the said VILLAGE may be called upon to pay any person or corporation by reason of any damages arising or
growing out of the doing of said work, or the repair or maintenance thereof, or the manner of doing the same, or
the neglect of the said PRINCIPAL, or his, her their, or its agents or servants, or the improper performance of the
said work by the said PRINCIPAL, or his, her, their, or its agents or servants, or the infringement of any patent or
patent rights by reason of the use of any materials furnished or work done as aforesaid or otherwise, then this
obligation shall be null and void, otherwise to remain in full force and effect.

The Surety (Sureties), for value received, hereby stipulates and agrees, if requested to do so by the VILLAGE, to fully
perform and complete the Work to be performed under the Contract, pursuant to the terms, conditions, and
covenants thereof, if the VILLAGE determines that the Principal, for any cause, has failed or neglected to fully
perform and complete such Work. The Surety (Sureties) further agrees to commence and diligently perform the
Work specified in the Contract, including physical site work, within twenty-five (25) business days after written
notice thereof from the VILLAGE and to complete all Work within such time as the VILLAGE may fix. The Surety and
the VILLAGE reserve all rights and defenses each may have against the other; provided, however, that the Surety
expressly agrees that its reservation of rights shall not provide a basis for non-performance of its obligation to
commence and to complete all Work as provided herein.

The Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties) and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or to the said Contract or Work to be performed thereunder, or by any payment thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any Work to be performed or any moneys due or to become due thereunder; and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to said Surety (Sureties) as though done or omitted to be done by or in relation to said Principal.

IN WITNESS WHEREOF, the Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this ____ day of _____, _____.

(Seal) _____ (L.S.)
Principal

By: _____

(Seal) _____ (L.S.)
Surety

By: _____

(Seal) _____ (L.S.)
Surety

By: _____

(Seal) _____ (L.S.)
Surety

By: _____

Bond Premium Rate _____

Bond Premium Cost _____

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.
Interior Renovations/ 006100A-2 #4.1523.01
Village of Woodbury Building Department
Highland Mills, NY

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.

An appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract should be executed.

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) certified copy of latest published financial statement of assets and liabilities of Surety.

AFFIX ACKNOWLEDGMENTS AND JUSTIFICATION OF SURETIES.

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

State of _____
County of _____ ss:

On this ____ day of _____, 20____, before me personally came to me known, _____ who, being by me duly sworn, did depose and say that he/she is the _____ of _____ the corporation described in and which executed the foregoing instrument; that he/she knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he/she signed his/her name thereto by like order.

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

State of _____
County of _____ ss:

On this ____ day of _____, 20____, before me personally appeared _____ to me known and known to me to be one of the members of the firm of _____ described in and who executed the foregoing instrument, and he/she acknowledged to me that he/she executed the same as and for the act and deed of said firm.

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of _____

County of _____ ss:

On this _____ day of _____, 20____, before me personally appeared _____ to me known and known to me to be the person described in and who executed the foregoing instrument and acknowledged that he/she executed the same.

Notary Public

END OF SECTION 006100A

SECTION 006100B

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _____

hereinafter referred to as the "Principal", and _____

hereinafter referred to as the "Surety" are held and firmly bound to THE VILLAGE OF WOODBURY, NEW YORK,
hereinafter referred to as the "VILLAGE", or to its successors and assigns in the penal sum of _____

Dollars (\$_____), lawful money of the United States, for the payment of which said sum of money well
and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and
assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to submit (or has submitted) to the VILLAGE the accompanying proposal, hereby
made a part hereof, to enter into a contract in writing for _____

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or
assigns and other Subcontractors to whom Work under this Contract is sublet and his or their successors and
assigns shall promptly pay or cause to be paid all lawful claims for:

(a) Wages and compensation for labor performed and services rendered by all persons engaged in the
prosecution of the Work under said Contract, and any amendment or extension thereof or addition thereto,
whether such persons be agents servants or employees of the Principal or any such Subcontractor, including
all persons so engaged who perform the work of laborers or mechanics at or in the vicinity of the site of the
Project regardless of any contractual relationship between the Principal or such Subcontractors, or his, her
or their successors or assigns, on the one hand and such laborers or mechanics on the other, but not
including office employees not regularly stationed at the site of the project; and

(b) Materials and supplies (whether incorporated in the permanent structure or not), as well as teams,
fuels, oils, implements or machinery furnished, used or consumed by said Principal or any subcontractor at
or in the vicinity of the site of the Project in the prosecution of the Work under said Contract and any
amendment or extension thereof or addition thereto; then this obligation shall be void, otherwise to remain
in full force and effect.

This bond is subject to the following additional conditions, limitations and agreements:

(a) The Principal and Surety (Sureties) agree that this bond shall be for the benefit of any materialmen
or laborer having a just claim, as well as the VILLAGE itself.

(b) All persons who have performed labor, rendered services or furnished materials and supplies, as

aforesaid, shall have a direct right of action against the Principal and his, her, its or their successors and assigns, and the Surety (Sureties) herein, or against either or both or any of them and their successors and assigns. Such persons may sue in their own name and may prosecute the suit to judgment and execution without the necessity of joining with any other persons as party plaintiff.

(c) The Principal and Surety (Sureties) agree that neither of them will hold the VILLAGE liable for any judgment for costs of otherwise, obtained by either or both of them against a laborer or materialman in a suit brought by either a laborer or materialman under this bond for moneys allegedly due for performing work or furnishing material.

(d) The Surety (Sureties) or its successors and assigns shall not be liable for any compensation recoverable by an employee or laborer under the Workmen's Compensation Law.

(e) In no event shall the Surety (Sureties), or its successors or assigns, be liable for a greater sum than the penalty of this bond or be subject to any suit, action or proceeding hereon that is instituted by any person, firm, or corporation hereunder later than two years after the complete performance of said Contract and final settlement thereof.

The Principal, for himself / herself / itself and successors and assigns, and the Surety (Sureties), for itself and its successors and assigns, do hereby expressly waive any objection that might be interposed as to the right of the VILLAGE 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, material men 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 VILLAGE to require the foregoing provisions to be placed in this bond.

And the Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties), and its bonds shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or of 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 provisions thereof, or by any assignment, subletting or other transfer thereof or of any part thereof, or of any Work to be performed, or any moneys due to become due thereunder and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, Subcontractors, and other transferees shall have the same effect as to said Surety (Sureties) as though done or omitted to be done or in relation to said Principal.

IN WITNESS HEREOF, the Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this _____ day of _____, _____.

(Seal)

_____(L.S.)
Principal

By: _____

(Seal) _____ (L.S.)
Surety

By: _____

(Seal) _____ (L.S.)
Surety

By: _____

(Seal) _____ (L.S.)
Surety

By: _____

(Seal) _____ (L.S.)
Surety

By: _____

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) certified copy of latest published financial statement of assets and liabilities of Surety.

AFFIX ACKNOWLEDGMENTS AND JUSTIFICATION OF SURETIES.

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

State of _____
County of _____ ss:

On this ____ day of _____, 20____, before me personally came to me known, _____ who, being by me duly sworn, did depose and say that he/she is the _____ of _____ the corporation described in and which executed the foregoing instrument; that he/she knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he/she signed his/her name thereto by like order.

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

State of _____
County of _____ ss:

On this ____ day of _____, 20____, before me personally appeared _____ to me known and known to me to be one of the members of the firm of _____ described in and who executed the foregoing instrument, and he/she acknowledged to me that he/she executed the same as and for the act and deed of said firm.

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of _____
County of _____ ss:

On this ____ day of _____, 20____, before me personally appeared _____ to me known and known to me to be the person described in and who executed the foregoing instrument and acknowledged that he/she executed the same.

Notary Public

END OF SECTION 006100B
006100B-4

Interior Renovations/
Village of Woodbury Building Department
Highland Mills, NY

#4.1523.01

SECTION 006100C

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _____

hereinafter referred to as the "Principal", and _____

hereinafter referred to as the "Surety" are held and firmly bound to THE VILLAGE OF WOODBURY, NEW YORK, hereinafter referred to as the "VILLAGE", or to its successors and assigns in the penal sum of _____

(\$ _____), Dollars lawful money of the United States, for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, on the ____ day of _____, 20__ the said Principal, as Contractor, entered into a contract for _____

for the sum of _____ Dollars (\$ _____); and

WHEREAS, under the terms and conditions for such work, the Principal as Contractor is required to give a bond for

Dollars (\$ _____), to protect the VILLAGE against the result of faulty materials or workmanship for a period of one year from and after the date of the final completion and acceptance of same, namely for a period from _____ through _____.

NOW, THEREFORE, if the Principal shall for a period of one year from and after the date of issue on final payment check to contractor for completion and acceptance of same by VILLAGE as Owner replace any and all defects arising in said Work whether resulting from defective materials or defective workmanship, after which period then the above obligation shall be void. Otherwise, it shall remain in full force and effect.

IN WITNESS WHEREOF, the Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this ____ day of _____, 20__.

(Seal) _____ (L.S.)
Principal

By: _____

(Seal) _____ (L.S.)
Surety

(Seal)

By: _____
_____(L.S.)
Surety

By: _____

(Seal)

_____(L.S.)
Surety

By: _____

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.

An appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract should be executed.

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) certified copy of latest published financial statement of assets and liabilities of Surety.

AFFIX ACKNOWLEDGMENTS AND JUSTIFICATION OF SURETIES.

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

State of _____
County of _____ ss:

On this ____ day of _____, 20____, before me personally came to me known, _____ who, being by me duly sworn, did depose and say that he/she is the _____ of _____ the corporation described in and which executed the foregoing instrument; that he/she knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he/she signed his/her name thereto by like order.

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

State of _____
County of _____ ss:

On this _____ day of _____, 20____, before me personally appeared _____ to me known and known to me to be one of the members of the firm of _____ described in and who executed the foregoing instrument, and he/she acknowledged to me that he/she executed the same as and for the act and deed of said firm.

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of _____
County of _____ ss:

On this _____ day of _____, 20____, before me personally appeared _____ to me known and known to me to be the person described in and who executed the foregoing instrument and acknowledged that he/she executed the same.

Notary Public

END OF SECTION 006100C

SECTION 008100 – PREVAILING WAGE SCHEDULE

PART 1 GENERAL

1.1 GENERAL

Wage rates shall apply as shown in the Prevailing Wage Schedule with PRC# 2020011216 prepared by the New York State Department of Labor, a copy of which is available at:

<https://applications.labor.ny.gov/wpp/showFindProject.do?method=showIt#>

and updates may be found at:

<https://applications.labor.ny.gov/wpp/publicViewPWChanges.do?method=showIt#>

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 008100



Andrew M. Cuomo, Governor

Roberta Reardon, Commissioner

Village of Woodbury Building

Veronica Moreno, LAN Associates
252 Main Street
2nd Floor
Goshen NY 10924

Schedule Year 2020 through 2021
Date Requested 11/03/2020
PRC# 2020011216

Location Village of Woodbury Building D
Project ID# 4.1523.01
Project Type Interior Renovations at Village of Woodbury Building Department

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 journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 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

Village of Woodbury Building

Veronica Moreno, LAN Associates
252 Main Street
2nd Floor
Goshen NY 10924

Schedule Year 2020 through 2021
Date Requested 11/03/2020
PRC# 2020011216

Location Village of Woodbury Building D
Project ID# 4.1523.01
Project Type Interior Renovations at Village of Woodbury Building Department

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

Orange County General Construction

Boilermaker

11/01/2020

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

11/01/2020

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Dutchess, Orange

WAGES

Per hour: 07/01/2020

Building:	
Millwright	\$ 44.25

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$ 40.46

OVERTIME PAY

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

HOLIDAY

HOLIDAY:

Paid: See (18,19) on HOLIDAY PAGE.

Paid: See (5,6,11,13,16,18,19,25) for 1st & 2nd yr.Apprentices

Overtime: See (5,6,11,13,16,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wages per hour:

One (1) year terms:

1st	2nd	3rd	4th
\$23.81	\$28.14	\$32.47	\$41.13

Supplemental benefits per hour:

1st	2nd	3rd	4th
\$27.50	\$30.08	\$32.94	\$37.17

8-740.2

Carpenter

11/01/2020

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Dutchess

PARTIAL COUNTIES

Orange: : The territory west demarcated by a line drawn from the Bear Mountain Bridge continuing east to the Bear Mountain Circle. The territory south demarcated by a line continuing north on 9W to the town of Cornwall where County Road 107 (also known as Quaker Rd) crosses under 9W to the centerline of Route 32, The territories south and east heading north on Route 32 to Orrs Mills Rd, then west on Orrs Mills Rd to Route 94, continue west and south on Route 94 to the Town of Chester, to the intersection of Kings Highway, continue south on Kings Highway to Bellvale Rd, west on Bellvale Rd to Bellvale Lakes Rd, then south on Bellvale Lakes Rd to Kain Rd, southeast on Kain Rd to Route 17A, then north and southeast along Route 17A to Route 210, then follow Route 210 to NJ Border.

WAGES

Per hour: 07/01/2020

Carpet/Resilient

Floor Coverer \$ 33.15

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

SUPPLEMENTAL BENEFITS

Per hour:

\$ 31.17

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
\$13.23	\$16.35	\$21.03	\$25.71

Supplemental Benefits per hour - All apprentice terms:

\$ 23.86

8-2287D&O

Carpenter

11/01/2020

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

11/01/2020

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 \$ 41.74

Driller Helper 32.62 32.92

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:

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

11/01/2020

JOB DESCRIPTION Carpenter - Building / Heavy&Highway

DISTRICT 2

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Wyoming, Yates

PARTIAL COUNTIES

Orange: The area lying on Northern side of Orange County demarcated by a line drawn from the Bear Mountain Bridge continuing west to the Bear Mountain Circle, continue North on 9W to the town of Cornwall where County Road 107 (also known as Quaker Rd) crosses under 9W, then east on County Road 107 to Route 32, then north on Route 32 to Orrs Mills Rd, then west on Orrs Mills Rd to Route 94, continue west and south on Route 94 to the Town of Chester, to the intersection of Kings Highway, continue south on Kings Highway to Bellvale Rd, west on Bellvale Rd to Bellvale Lakes Rd, then south on Bellvale Lakes Rd to Kain Rd, southeast on Kain Rd to Route 17A, then north and southeast along Route 17A to Route 210, then follow Route 210 to NJ Border.

WAGES

Wages per hour:	07/01/2020	07/01/2021 Additional
Carpenter - ONLY for Artificial Turf/Synthetic Sport Surface	\$ 31.48	\$ 1.15

Note - Does not include the operation of equipment. Please see Operating Engineers rates.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$ 23.65

OVERTIME PAY

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

HOLIDAY

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

Notes:

When a holiday falls upon a Saturday, it shall be observed on the preceding Friday. When a holiday falls upon a Sunday, it shall be observed on the following Monday.

An employee taking an unexcused day off the regularly scheduled day before or after a paid Holiday shall not receive Holiday pay.

REGISTERED APPRENTICES

Wages per hour:

One year terms at the following percentage of Journeyman's wage:

1st	2nd	3rd	4th
55%	60%	70%	80%

Supplemental Benefits per hour:

1st year term	\$ 11.80
2nd year term	11.80
3rd year term	14.45
4th year term	14.45

2-42AtSS

Carpenter - Building / Heavy&Highway

11/01/2020

JOB DESCRIPTION Carpenter - Building / Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Columbia, Dutchess, Orange, Sullivan, Ulster

WAGES

WAGES:(per hour)	07/01/2020	07/01/2021 Additional
BUILDING/HEAVY&HIGHWAY/TUNNEL		
Carpenter, Dockbuilder,	\$ 39.02	\$ 0.80

Piledriver, Dive Tender,
and Diver (Dry)

Diver (Wet) \$ 54.76

SHIFT DIFFERENTIAL: When 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 benefits.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 28.03

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
\$ 19.68	\$ 23.11	\$ 24.82	\$ 26.53	\$ 29.96

Indentured before July 1 2016

1st	2nd	3rd	4th
\$ 19.68	\$ 23.11	\$ 26.53	\$ 29.96

SUPPLEMENTAL BENEFITS per hour:

All terms \$ 16.33

11-279.2B/H&H

Carpenter - Floor Coverer

11/01/2020

JOB DESCRIPTION Carpenter - Floor Coverer

DISTRICT 11

ENTIRE COUNTIES

Columbia, Sullivan, Ulster

PARTIAL COUNTIES

Orange: The area lying on Northern side of Orange County demarcated by a line drawn from the Bear Mountain Bridge continuing west to the Bear Mountain Circle, continue North on 9W to the town of Cornwall where County Road 107 (also known as Quaker Rd) crosses under 9W, then east on County Road 107 to Route 32, then north on Route 32 to Orrs Mills Rd, then west on Orrs Mills Rd to Route 94, continue west and south on Route 94 to the Town of Chester, to the intersection of Kings Highway, continue south on Kings Highway to Bellvale Rd, west on Bellvale Rd to Bellvale Lakes Rd, then south on Bellvale Lakes Rd to Kain Rd, southeast on Kain Rd to Route 17A, then north and southeast along Route 17A to Route 210, then follow Route 210 to NJ Border.

WAGES

WAGES:(per hour)

	07/01/2020	07/01/2021
		Additional
Carpet/Resilient Floor Coverer	\$ 39.02	\$ 0.80

SHIFT DIFFERENTIAL: When mandated by a Government Agency irregular or off shift can be worked. The Carpenter shall receive an additional fifteen (15) percent 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 materials and required to wear protective equipment shall receive two (2) hours extra pay per day, plus applicable benefits.

SUPPLEMENTAL BENEFITS

Per hour:

Journey worker \$ 28.03

OVERTIME PAY

BUILDING:

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

HEAVY/HIGHWAY:

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

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

**T applies to Heavy/Highway 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:

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
\$ 19.68	\$ 23.11	\$ 24.82	\$ 26.53	\$ 29.96

Indentured before July 1 2016

1st	2nd	3rd	4th
\$ 19.68	\$ 23.11	\$ 26.53	\$ 29.96

SUPPLEMENTAL BENEFITS per hour:

All terms \$ 16.33

11-279.2Floor

Electrician

11/01/2020

JOB DESCRIPTION Electrician

DISTRICT 11

ENTIRE COUNTIES

Orange, Putnam, Rockland

PARTIAL COUNTIES

Dutchess: Towns of Fishkill, East Fishkill, and Beacon.

WAGES

Per hour:

	07/01/2020	04/01/2021
Electrician Wireman/Technician	\$ 46.00	\$ 47.00

SHIFT DIFFERENTIAL: On Public Work in New York State when shift work is mandated either in the job specifications or by the contracting agency, the following rates apply:

Shift worked between 4:30pm & 12:30am	\$ 53.97	\$ 55.15
Shift worked between 12:30am & 8:30am	\$ 60.46	\$ 61.77

NOTE ADDITIONAL AMOUNTS PAID FOR THE FOLLOWING WORK LISTED BELOW (subject to overtime premiums):

- On jobs where employees are required to work from boatswain chairs, swinging scaffolds, etc., forty (40) feet or more above the ground, or under compressed air, using Scottair packs, gas masks or in shafts or tunnels, they shall receive an additional \$2.00 per hour above the regular straight time rate.

- Journeyman Wireman when performing welding or cable splicing: \$2.00 above the Journeyman Wireman rate of pay.

- Journeyman Wireman required to have a NYS Asbestos Certificate: \$2.00 above the Journeyman Wireman rate of pay.

- Journeyman Wireman required to have a CDL: \$2.00 above the Journeyman Wireman rate of pay.

SUPPLEMENTAL BENEFITS

Per hour:

	07/01/2020	04/01/2021
Journeyman	\$ 32.38 plus 3% of straight or premium wage	\$ 33.69 plus 3% of straight or premium wage

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 13, 15, 16, 25) on HOLIDAY PAGE

When the holiday falls on a Saturday it is observed the Friday before. When the holiday falls on a Sunday it is observed on the Monday after.

REGISTERED APPRENTICES

WAGES:

(1)year terms at the following rates

07/01/2020	1st	2nd	3rd	4th	5th	6th
1st Shift	\$ 13.20	\$ 17.60	\$ 22.00	\$ 26.40	\$ 30.80	\$ 33.00
2nd Shift	15.49	20.65	25.81	30.98	36.14	38.72
3rd Shift	17.35	23.13	28.91	34.70	40.48	43.47
04/01/2021	1st	2nd	3rd	4th	5th	6th
1st Shift	\$ 13.50	\$ 18.00	\$ 22.50	\$ 27.00	\$ 31.50	\$ 33.75
2nd Shift	15.84	21.12	26.40	31.68	36.96	39.60
3rd Shift	17.74	23.66	29.57	35.48	41.40	44.36

SUPPLEMENTAL BENEFITS per hour:

07/01/2020

1st term	\$ 14.92 plus 3% of straight or premium wage
2nd term	\$ 16.42 plus 3% of straight or premium wage
3rd term	\$ 18.42 plus 3% of straight or premium wage
4th term	\$ 19.92 plus 3% of straight or premium wage
5th & 6th term	\$ 21.92 plus 3% of straight or premium wage

09/01/2020

1st term	\$ 15.81 plus 3% of straight or premium wage
2nd term	\$ 16.31 plus 3% of straight or premium wage
3rd term	\$ 18.31 plus 3% of straight or premium wage
4th term	\$ 19.81 plus 3% of straight or premium wage
5th term	\$ 21.81 plus 3% of straight or premium wage
6th term	\$ 22.31 plus 3% of straight or premium wage

11-363/1

Elevator Constructor

11/01/2020

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
50 %	55 %	65 %	70 %	80 %

(*)Plus 6% of the hourly rate, no additional supplemental benefits.

Supplemental Benefits per hour worked:

Same as Journeyman/Helper

1-138

Glazier	11/01/2020
----------------	-------------------

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

11/01/2020

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

11/01/2020

JOB DESCRIPTION Ironworker

DISTRICT 11

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster

WAGES

Per hour:

07/01/2020

Structural	\$ 48.98
Reinforcing*	48.98
Ornamental	48.98
Chain Link Fence	48.98

*NOTE: For Reinforcing classification ONLY, Ironworker 4-46Reinf rates apply in Rockland County's southern section (south of Convent Road and east of Blue Hills Road).

On Government Mandated Irregular Work Days or Shift Work, the following wage will be paid:

1st Shift	\$ 48.98
2nd Shift	62.38
3rd Shift	66.85

**Note- Any shift that works past 12:00 midnight shall receive the 3rd shift differential.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 40.35
------------	----------

OVERTIME PAY

See (B1, Q, V) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

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

If a holiday falls on Saturday, it will be observed Friday. If a holiday falls on Sunday, it will be observed Monday.

REGISTERED APPRENTICES

Wages:

(1) year terms at the following wage:

	1st yr	2nd yr	3rd yr	4th yr
1st Shift	\$ 24.49	\$ 29.39	\$ 34.29	\$ 39.18
2nd Shift	33.35	39.16	44.97	50.76
3rd Shift	36.31	42.42	48.53	54.63

Supplemental Benefits per hour:

1st year	\$ 34.60
----------	----------

2nd year	35.75
3rd year	36.90
4th year	38.05

11-417

Laborer - Building**11/01/2020**

JOB DESCRIPTION Laborer - Building**DISTRICT** 11**ENTIRE COUNTIES**

Orange, Sullivan, Ulster

PARTIAL COUNTIES

Delaware: Only the Townships of Andes, Bovina, Davenport, Delhi, Franklin, Hamden, Harpersfield, Kortright, Meredith, Middletown, Roxbury, and Stamford.

Greene: Only the Township of Catskill.

WAGES

GENERAL LABORER: flag person, portable generator tender, portable pump tender, temporary heat tender, chipping hammer, acoustic pump, mixer, concrete laborer, demolition, demo saw, gunite, general cleanup, landscaping, mason tender, jackhammer, pavement breaker, pressure blasting, signalperson, buggies, wrecking, chain saw, vacuums, cutting torch, discharge pipe, mega mixer, pump crete machine.

INTERMEDIATE LABORER: excavation, grading, backfilling, tampers, walk behind roller, when OSHA or contractor requires negative respirator.

PREMIUM LABORER: Asbestos abatement work, toxic and hazardous abatement, lead abatement work, environmental work.

WAGES:(per hour)

	07/01/2020	06/01/2021	06/01/2022
General	\$ 37.20	\$ 38.25	\$ 39.30
Intermediate	39.00	40.10	41.20
Premium	41.85	43.00	44.20

These rates will cover all work within five feet of the building foundation line.

Shift Differential: On all Governmental mandated irregular or off shift work, an additional 25% of wage is required. The 25% shift differential will be paid on public works contract for shifts or irregular workdays outside the normal working hours for 2nd and 3rd shifts or irregular work day or when mandated or required by state, federal, county, local or other governmental agency contracts.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 29.93	\$ 30.95	\$ 32.00
Shift	36.70	37.97	39.28

OVERTIME PAY

See (B, E, E5, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

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

Holidays that fall on Saturday shall be observed on Friday, when holidays fall on Sunday they shall be observed on Monday.

REGISTERED APPRENTICES

1000 hour terms at the following wage rates:

1st term	\$ 20.46	\$ 21.04	\$ 21.62
2nd term	24.18	24.86	25.55
3rd term	27.90	28.69	29.48
4th term	31.62	32.51	33.41

Supplemental Benefits per hour:

Apprentices	\$ 24.83	\$ 25.85	\$ 26.90
Shift	30.17	31.44	32.75

11-17.BA

Laborer - Heavy&Highway**11/01/2020**

JOB DESCRIPTION Laborer - Heavy&Highway**DISTRICT** 11**ENTIRE COUNTIES**

Orange, Sullivan, Ulster

PARTIAL COUNTIES

Delaware: Only the Townships of Andes, Bovina, Middletown, Roxbury, Franklin, Hamden, Stamford, Delhi, Kortright, Harpersfield, Meredith, and Davenport.

Greene: Only the Township of Catskill.

WAGES

CLASS 1: Flagperson, gateperson.

CLASS 2: General laborer, chuck tender, nipper, powder carrier, magazine tender, concrete men, vibrator men, mason tender, mortar men, traffic control, custodial work, temporary heat, pump men, pit men, dump men, asphalt men, joint setter, signalman, pipe men, riprap, dry stone layers, jack hammer, bush hammer, pavement breaker, gunnite nozzle, men on mulching & seeding machines, all seeding & sod laying, landscape work, walk behind self-propelled power saws, grinder, groover, walk behind rollers and tampers of all types, burner men, filling and wiring of baskets for gabion walls, chain saw operator, railroad track laborers, power buggy & pumpcrete ops., plaster & acoustic pump, power brush cutter, retention liners, walk behind surface planer, chipping hammer, manhole, catch basin or inlet installing, mortar mixer, laser men. *Micropaving and crack sealing.

CLASS 3: Asbestos, toxic, bio remediation and phyto remediation, lead or hazardous materials abatement when certification or license is required, Drilling Equipment Only Where a Separate Air Compressor Unit Supplies Power.

CLASS 4: Asphalt screedman, blaster, all laborers involved in pipejacking and boring operations not exceeding more than 10 feet into pipe, boring or drilled area.

WAGES:(per hour)

07/01/2020

CLASS 1	\$ 35.25
CLASS 2	40.00
CLASS 3	44.25
CLASS 4	49.10

*NOTE: Micropaving and crack sealing laborers shall receive \$2.50 per hour over the CLASS 2 rate.

SHIFT DIFFERENTIAL: On all NYS D.O.T. or other Governmental mandated irregular or off shift work, an additional 15% of wage is required.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 29.75
Shift	33.81

OVERTIME PAY

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

Employees that work on a holiday which falls on a Saturday, shall be paid two and one-half (2-1/2) times the regular hourly rate for all hours worked on that day.

HOLIDAY

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

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

REGISTERED APPRENTICES

1000 hour terms at the following wage rates.

1st term	\$ 20.46
2nd term	24.18
3rd term	27.90
4th term	31.62

Supplemental Benefits per hour:

Apprentices	\$ 24.65
Shift	27.85

11-17.1H/H

Laborer - Tunnel

11/01/2020

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

11/01/2020

JOB DESCRIPTION Lineman Electrician

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, Wyoming, Yates

WAGES

Per hour:

NOTE: Includes Teledata Work within ten (10) feet of High Voltage Transmission Lines

Below rates applicable on all overhead and underground distribution and maintenance work, and all overhead and underground transmission line work and the installation of fiber optic cable where no other construction trades are or have been involved. (Ref #14.01.01)

07/01/2020

Lineman, Technician	\$ 53.50
Crane, Crawler Backhoe	53.50
Welder, Cable Splicer	53.50

Digging Mach. Operator	48.15
Tractor Trailer Driver	45.48
Groundman, Truck Driver	42.80
Equipment Mechanic	42.80
Flagman	32.10

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

Below rates applicable on all electrical sub-stations, switching structures, fiber optic cable and all other work not defined as "Utility outside electrical work". (Ref #14.02.01-A)

Lineman, Technician	\$ 53.50
Crane, Crawler Backhoe	53.50
Cable Splicer	58.85
Certified Welder -	
Pipe Type Cable	56.18
Digging Mach. Operator	48.15
Tractor Trailer Driver	45.48
Groundman, Truck Driver	42.80
Equipment Mechanic	42.80
Flagman	32.10

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

Below rates apply on switching structures, maintenance projects, railroad catenary install/maintenance third rail installation, bonding of rails and pipe type cable and installation of fiber optic cable. (Ref #14.02.01-B)

Lineman, Tech, Welder	\$ 54.82
Crane, Crawler Backhoe	54.82
Cable Splicer	60.30
Certified Welder -	
Pipe Type Cable	57.56
Digging Mach. Operator	49.34
Tractor Trailer Driver	46.60
Groundman, Truck Driver	43.86
Equipment Mechanic	43.86
Flagman	32.89

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

Below rates applicable on all overhead and underground transmission line work & fiber optic cable where other construction trades are or have been involved. This applies to transmission line work only, not other construction. (Ref #14.03.01)

Lineman, Tech, Welder	\$ 56.01
Crane, Crawler Backhoe	56.01
Cable Splicer	56.01
Digging Mach. Operator	50.41
Tractor Trailer Driver	47.61
Groundman, Truck Driver	44.81
Equipment Mechanic	44.81
Flagman	33.61

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 (also required on non-worked holidays):

The following SUPPLEMENTAL BENEFITS apply to all classification categories of CONSTRUCTION, TRANSMISSION and DISTRIBUTION.

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.

OVERTIME PAY

See (B, E, Q,) on OVERTIME PAGE. *Note* Double time for all 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 at the following percentage of the applicable Journeyman Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour: Same as Journeyman

6-1249a

Lineman Electrician - Teledata

11/01/2020

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	*plus 3% of
	wage paid	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

11/01/2020

JOB DESCRIPTION Lineman Electrician - Traffic Signal, Lighting

DISTRICT 6

ENTIRE COUNTIES

Columbia, Dutchess, Orange, Putnam, Rockland, Ulster

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 #14.01.02)

Per hour: 07/01/2020

Lineman, Technician	\$ 47.48
Crane, Crawler Backhoe	47.48
Certified Welder	49.85
Digging Machine	42.73
Tractor Trailer Driver	40.36
Groundman, Truck Driver	37.98
Equipment Mechanic	37.98
Flagman	28.49

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 all 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.

	07/01/2020
1st term	\$ 28.49
2nd term	30.86
3rd term	33.24
4th term	35.61
5th term	37.98
6th term	40.36
7th term	42.73

SUPPLEMENTAL BENEFITS per hour: Same as Journeyman

6-1249aReg8LT

Lineman Electrician - Tree Trimmer

11/01/2020

JOB DESCRIPTION Lineman Electrician - Tree Trimmer

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, Wyoming, Yates

WAGES

Applies to line clearance, tree work and right-of-way preparation on all new or existing energized overhead or underground electrical, telephone and CATV lines. This also would include stump removal near underground energized electrical lines, including telephone and CATV lines.

Per hour:	07/01/2020	01/03/21	01/02/22	01/01/23
Tree Trimmer	\$ 26.56	\$ 27.36	\$ 28.25	\$ 29.59
Equipment Operator	23.49	24.19	24.98	26.17
Equipment Mechanic	23.49	24.19	24.98	26.17
Truck Driver	19.56	20.15	20.80	21.79
Groundman	16.11	16.59	17.13	17.94
Flag person	11.61	11.96	12.35	12.94

SUPPLEMENTAL BENEFITS

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

	\$ 9.98	\$ 9.98	\$ 10.23	\$ 10.48
Journeyman	*plus 3% of hourly wage	*plus 3% of hourly wage	*plus 3% of hourly wage	*plus 3% of hourly wage

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

NOTE: All paid holidays falling on a Saturday shall be observed on the preceding Friday.

All paid holidays falling on a Sunday shall be observed on the following Monday.

6-1249TT

Mason - Building	11/01/2020
-------------------------	-------------------

JOB DESCRIPTION Mason - Building

DISTRICT 11

ENTIRE COUNTIES

Dutchess, Sullivan, Ulster

PARTIAL COUNTIES

Orange: Entire county except the Township of Tuxedo.

WAGES

Per hour:

07/01/2020

Bricklayer	\$ 41.31
Cement Mason	41.31
Plasterer/Stone Mason	41.31
Pointer/Caulker	41.31

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 \$ 34.44

OVERTIME PAY

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

11-5du-b

Mason - Building	11/01/2020
-------------------------	-------------------

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Sullivan, Ulster

WAGES

Per hour:

07/01/2020

12/07/2020

Building:

Tile, Marble,& Terrazzo		Additional
Mechanic/Setter	\$54.63	\$0.79

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker: \$ 22.31*
+ \$7.50

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

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

Double time rate applies after 10 hours

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

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

REGISTERED APPRENTICES

Wage per hour:

(Counties of Orange & Putnam)

750 hour terms at the following wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1-	751-	1501-	2251-	3001-	3751-	4501-	5251-	6001-	6751-
750	1500	2250	3000	3750	4500	5250	6000	6750	7500
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:

(Counties of Orange & Putnam)

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

Wages per hour:

(Counties of Dutchess,Sullivan,Ulster)

750 hour terms at the following wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1-	751-	1501-	2251-	3001-	3751-	4501-	5251-	6001-	6751-
750	1500	2250	3000	3750	4500	5250	6000	6750	7500
\$19.16	\$23.16	\$25.14	\$29.14	\$31.81	\$35.32	\$38.52	\$41.52	\$43.05	\$46.30

Supplemental Benefits per hour:

(Counties of Dutchess,Sullivan,Ulster)

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$12.55*	\$12.55*	\$14.56*	\$14.56*	\$15.56*	\$16.06*	\$16.56*	\$17.56*	\$15.56*	\$20.31*
+\$0.64	+\$0.68	+\$0.73	+\$0.77	+\$1.14	+\$1.18	+\$1.52	+\$1.56	+\$6.08	+\$6.16
									9-7/52B

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Sullivan, Ulster

WAGES

Per hour:	07/01/2020	12/07/2020
Building		
Tile, Marble, &		Additional
Terrazzo Finisher	\$ 45.12	\$0.67

SUPPLEMENTAL BENEFITS

Journeyworker:

Per Hour	\$ 19.16*
	+ \$7.37

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

OVERTIME PAY

See (A, *E, Q) on OVERTIME PAGE

Double time rate applies after 10 hours on Saturdays.

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

9-7/88B-tf

Mason - Building

11/01/2020

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
------------	----------

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	11/01/2020
-------------------------	-------------------

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

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 - Heavy&Highway	11/01/2020
----------------------------------	-------------------

JOB DESCRIPTION Mason - Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Dutchess, Sullivan, Ulster

PARTIAL COUNTIES

Orange: Entire county except the Township of Tuxedo.

WAGES

Per hour:

07/01/2020

Bricklayer \$ 41.82
Cement Mason 41.82

Marble/Stone Mason	41.82
Plasterer	41.82
Pointer/Caulker	41.82

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 \$ 34.43

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

11-5du-H/H

Mason - Heavy&Highway

11/01/2020

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 / Heavy&Highway

11/01/2020

JOB DESCRIPTION Operating Engineer - Building / Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Delaware, Orange, Rockland, Sullivan, Ulster

WAGES

CLASS A5: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with 140ft boom and over.

CLASS A4: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with 100ft to 139ft boom.

CLASS A3: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes with a boom under 100ft.

CLASS A2: Cranes, Derricks and Pile Drivers less than 100 tons with 140ft boom and over.

CLASS A1: Cranes, Derricks and Piler Drivers less than 100 tons with a 100ft to 139ft boom.

CLASS A: Cranes, Derricks and Pile Drivers less than 100 tons with a boom under 100ft.; Autograde Combn. Subgrader, Base Material Spreader and Base Trimmer (CMI and Similar Types); Autograde Pavement profiler (CMI and Similar Types); Autograde Pavement Profiler and Recycle type (CMI and Similar Type); Autograde Placer-Trimmed-Spreader Comb. (CMI & Similar types); Autograde Slipform Paver (CMI & Similar Types); Central Power Plants (all types); Chief of Party; Concrete Paving Machines; Drill (Baur, AMI and Similar Types); Drillmaster, Quarmaster (Down the Hole Drill), Rotary Drill, Self-Propelled Hydraulic Drill, Self-Powered Drill; Draglines; Elevator Graders; Excavator; Front End Loaders (5 yds. and over); Gradalls; Grader-Rago; Helicopters (Co-Pilot); Helicopters (Communications Engineer); Juntann Pile Driver; Locomotive (Large); Mucking Machines; Pavement & Concrete Breaker, i.e., Superhammer & Hoe Ram; Roadway Surface Grinder; Prentice Truck; Scooper (Loader and Shovel); Shovels; Tree Chopper with Boom; Trench Machines (Cable Plow); Tunnel Boring Machine; Vacuum Truck

CLASS B: "A" Frame; Backhoe (Combination); Boom Attachment on Loaders (Rate based on size of Bucket) not applicable to Pipehook; Boring and Drilling Machines; Brush Chopper, Shredder and Tree Shredder, Tree Shearer; Bulldozer (Fine Grade); Cableways; Carryalls; Concrete Pump; Concrete Pumping System, Pump Concrete and Similar Types; Conveyors (125 ft. and over); Drill Doctor (duties incl. Dust Collector Maintenance); Front End Loaders (2 yds. but less than 5 yds.); Graders (Finish); Groove Cutting Machine (Ride on Type); Heater Planer; Hoists (all type Hoists, shall also include Steam, Gas, Diesel, Electric, Air Hydraulic, Single and Double Drum, Concrete, Brick Shaft Caisson, Snorkel Roof, and/or any other Similar Type Hoisting Machines, portable or stationary, except Chicago Boom Type); Long Boom Rate to be applied if Hoist is "Outside Material Tower Hoist***"; Hydraulic Cranes-10 tons and under; Hydraulic Dredge; Hydro-Axe; Hydro Blaster; Jacks-Screw Air Hydraulic Power Operated Unit or Console Type (not hand Jack or Pile Load Test Type); Log Skidder; Pans; Pavers (all) concrete; Plate and Frame Filter Press; Pumpcrete Machines, Squeeze-crete & Concrete Pumping (regardless of size); Scrapers; Side Booms; "Straddle" Carrier-Ross and similar types; Winch Trucks (Hoisting); Whip Hammer

CLASS C: Asphalt Curbing Machine; Asphalt Plant Engineer; Asphalt Spreader; Autograde Tube Finisher and Texturing Machine (CMI & Similar types); Autograde Curecrete Machine (CMI & Similar Types); Autograde Curb Trimmer & Sidewalk, Shoulder, Slipform (CMI & Similar Types); Bar Bending Machines (Power); Batchers, Batching Plant and Crusher on Site; Belt Conveyor Systems; Boom Type Skimmer Machines; Bridge Deck Finisher; Bulldozer(except fine grade); Car Dumpers (Railroad); Compressor and Blower Type Units (used independently or mounted on dual purpose Trucks, on Job Site or in conjunction with jobsite, in Loading and Unloading of Concrete, Cement, Fly Ash, Instacrete, or Similar Type Materials); Compressors (2 or 3 in Battery); Concrete Finishing Machines; Concrete cleaning decontamination machine operator; Concrete Saws and Cutters (Ride-on type); Concrete Spreaders (Hetzl, Rexomatic and Similar Types); Concrete Vibrators; Conveyors (under 125 feet); Crushing Machines; Directional Boring Machines; Ditching Machine-small (Ditch-witch, Vermeer, or Similar type); Dope Pots (Mechanical with or without pump); Dumpsters; Elevator; Fireman; Fork Lifts (Economobile, Lull and Similar Types of Equipment); Front End Loaders (1 yd.and over but under 2 yds.); Generators (2 or 3 in Battery); Giraffe Grinders; Grout Pump; Gunnite Machines (excluding nozzle); Hammer Vibrator (in conjunction with Generator); Heavy Equipment Robotics Operator Technician; Hoists-Roof, Tugger, Aerial Platform Hoist & House Cars; Hoppers; Hopper Doors (power operated); Hydro Blaster; Hydraulic Jacking Trailer; Ladders (motorized); Laddervator; Locomotive-dinky type; Maintenance -Utility Man; Master Environmental Maintenance Technician; Mechanics; Mixers (Excepting Paving Mixers); Motor Patrols; Pavement Breakers (small self propelled ride on type-also maintains compressor hydraulic unit); Pavement Breaker-truck mounted; Pipe Bending Machine (Power); Pitch Pump; Plaster Pump (regardless of size); Post Hole Digger (Post Pounder & Auger); Rod Bending Machines (Power); Roller-Black Top; Scales (Power); Seaman pulverizing mixer; Shoulder widener; Silos; Skidsteer (all attachments); Skimmer Machines (boom-type); Steel Cutting Machine (service & maintain); Tam Rock Drill; Tractors; Transfer Machine; Captain (Power Boats); Tug Master (powerboats); Ultra High Pressure Waterjet Cutting Tool System operator/maintenance technician; Vacuum Blasting Machine; Vibrating Plants (used inconjunction with unloading); Welder and Repair Mechanics

CLASS D: Brooms and Sweepers; Chippers; Compressor (single); Concrete Spreaders (small type); Conveyor Loaders (not including Elevator Graders); Engines-large diesel (1620 HP) and Staging Pump; Farm Tractors; Fertilizing Equipment (Operation & Maint. of); Fine Grade Machine (small type); Form Line Graders (small type); Front End Loader (under 1 yard); Generator (single); Grease, Gas, Fuel and Oil supply trucks; Heaters (Nelson or other type incl. Propane, Natural Gas or Flowtype Units); Lights, Portable Generating Light Plants; Mixers (Concrete, small); Mulching Equipment (Operation and Maintenance of); Pumps (2 or less than 4 inch suction); Pumps (4 inch suction and over incl. submersible pumps); Pumps (Diesel Engine and Hydraulic-immaterial of power); Road Finishing Machines (small type); Rollers-grade, fill or stone base; Seeding Equip. (Operation and Maintenance of); Sprinkler & Water Pump Trucks (used on jobsite or in conjunction with jobsite); Steam Jennies and Boilers-irrespective of use; Stone Spreader; Tamping Machines, Vibrating Ride-on; Temporary Heating Plant (Nelson or other type, incl. Propane, Natural Gas or Flow Type Units); Water & Sprinkler Trucks (used on or in conjunction with jobsite); Welding Machines (Gas, Diesel, and/or Electric Converters of any type, single, two, or three in a battery); Wellpoint Systems (including installation by Bull Gang and Maintenance of)

CLASS E: Assistant Engineer/Oiler; Drillers Helper; Maintenance Apprentice (Deck Hand); Maintenance Apprentice (Oiler); Mechanics' Helper; Tire Repair and Maintenance; Transit/Instrument Man

WAGES:(per hour)

	07/01/2020	07/01/2021 Additional	07/01/2022 Additional
Class A5	\$ 61.32	\$ 2.30	\$ 2.25
Class A4	60.32		
Class A3	59.32		
Class A2	56.82		
Class A1	55.82		
Class A	54.82		
Class B	53.23		
Class C	51.32		
Class D	49.69		
Class E	47.98		
Safety Engineer	55.56		
**Outside Material Hoist (Class B) receives \$ 1.00 per hour on 110 feet up to 199 feet total height, \$ 2.00 per hour on 200 feet and over total height.			

Helicopter:	
Pilot/Engineer	56.64
Co Pilot	54.82
Communications Engineer	54.82

Surveying:	
Chief of Party	54.82
Transit/Instrument Man	47.98
Rod/Chainman	45.40
Additional \$0.75 for Survey work Tunnel under compressed air.	
Additional \$0.50 for Hydrographic work.	

- SHIFT WORK: On all Government mandated irregular or off shift work, an additional 15% on straight time hours.

- On HAZARDOUS WASTE REMOVAL or ASBESTOS REMOVAL work, or any state or federally DESIGNATED HAZARDOUS WASTE SITE:

For projects bid on or before April 1, 2020...Where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection, the Operating Engineer shall receive the hourly wage plus an additional twenty percent (20%) of that wage for the entire shift.

For projects bid after April 1, 2020...On hazardous waste removal work of any kind, including state or federally designated site where the operating engineer is required to wear level A, B, or C personal protection the operating engineer shall receive an hourly wage rate of his regular hourly wage plus \$5.00 per hour. An operating engineer working at a hazardous waste removal project or site at a task requiring hazardous waste related certification, but who is not working in a zone requiring level A, B, or C personal protection, shall receive an hourly wage rate of his regular rate plus \$ 1.00 per hour. This shall also apply to sites where the level D personal protection is required.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman \$ 34.35

SHIFT WORK: On all Government mandated irregular or off shift work, an additional 15% on straight time hours.

OVERTIME PAY

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

*15% premium is also required on shift work benefits

HOLIDAY

Paid: See (5, 6, 10, 13, 15) on HOLIDAY PAGE

Overtime: See (5, 6, 10, 13, 15) on HOLIDAY PAGE

Holidays falling on Sunday will be celebrated on Monday.

REGISTERED APPRENTICES

(1) year terms at the following percentage of journeyman's wage.

1st	2nd	3rd	4th
60%	70%	80%	90%

Supplemental Benefits per hour:

Apprentices \$ 34.35

11-825

Operating Engineer - Marine Dredging

11/01/2020

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 Deck Captain, Leverman Mechanical Dredge Operator Licensed Tug Operator 1000HP or more.	\$ 40.31	\$ 41.42
CLASS A2 Crane Operator (360 swing)	35.92	36.91
CLASS B Dozer, Front Loader Operator on Land	To conform to Operating Engineer Prevailing Wage in locality where work is being performed including benefits.	
CLASS B1 Derrick Operator (180 swing) Spider/Spill Barge Operator Operator II, Fill Placer,	34.86	35.82

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 - Steel Erectors	11/01/2020
--	-------------------

JOB DESCRIPTION Operating Engineer - Steel Erectors

DISTRICT 11

ENTIRE COUNTIES

Delaware, Orange, Rockland, Sullivan, Ulster

WAGES

CLASS A3: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with a 140 ft. boom and over.

CLASS A2: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with up to a 139 ft. boom and under.

CLASS A1: Cranes, Derricks and Pile Drivers less than 100 tons with a 140 ft. boom and over.

CLASS A: Cranes, Derricks and Pile Drivers less than 100 tons with up to a 139 ft. boom and under.

CLASS B: "A" Frame; Cherry Pickers(10 tons and under); Hoists (all type Hoists, shall also include Steam, Gas, Diesel, Electric, Air Hydraulic, Single and Double Drum, Concrete, Brick Shaft Caisson, Snorkel Roof, and/or any other Similar Type Hoisting Machines, portable or stationary, except Chicago Boom Type); Jacks-Screw Air Hydraulic Power Operated Unit or Console Type (not hand Jack or Pile Load Test Type); Side Booms; Straddle Carrier

CLASS C: Aerial Platform used as Hoist; Compressors (2 or 3 in Battery); Concrete cleaning/ decontamination machine operator; Directional Boring Machines; Elevator or House Cars; Conveyers and Tugger Hoists; Fireman; Fork Lifts; Generators (2 or 3 in Battery); Heavy Equipment Robotics Operator/Technician; Master Environmental Maintenance Technician; Maintenance -Utility Man; Rod Bending Machines (Power); Captain(powerboat); Tug Master; Ultra High Pressure Waterjet Cutting Tool System; Vacuum Blasting Machine; Welding Machines(gas or electric,2 or 3 in battery, including diesels); Transfer Machine; Apprentice Engineer/Oiler with either one compressor or one welding machine when used for decontamination and remediation

CLASS D: Compressor (single); Welding Machines (Gas, Diesel, and/or Electric Converters of any type); Welding System Multiple (Rectifier Transformer type)

CLASS E: Assistant Engineer/Oiler; Maintenance Apprentice (Deck Hand);Drillers Helper; Maintenance Apprentice (Oiler); Mechanics' Helper; Transit/Instrument Man

WAGES:(per hour)

	07/01/2020	07/01/2021 Additional	07/01/2022 Additional
Class A3	\$ 63.34	\$ 2.30	\$ 2.25
Class A2	61.68		
Class A1	58.84		
Class A	57.18		
Class B	54.39		
Class C	51.73		
Class D	50.20		
Class E	48.44		
Vacuum Truck	55.15		
Safety Engineer	56.01		

Helicopter:

Pilot/Engineer	58.84
Co Pilot	58.45
Communications Engineer	58.45

Surveying:

Chief of Party	55.15
Transit/Instrument man	48.44
Rod/Chainman	45.40

Additional \$0.75 for Survey work Tunnels under compressed air.

Additional \$0.50 for Hydrographic work.

- SHIFT WORK: On all Government mandated irregular or off shift work, an additional 15% on straight time hours.

- On HAZARDOUS WASTE REMOVAL or ASBESTOS REMOVAL work, or any state or federally DESIGNATED HAZARDOUS WASTE SITE:

For projects bid on or before April 1, 2020...Where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection, the Operating Engineer shall receive the hourly wage plus an additional twenty percent (20%) of that wage for the entire shift.

For projects bid after April 1, 2020...On hazardous waste removal work of any kind, including state or federally designated site where the operating engineer is required to wear level A, B, or C personal protection the operating engineer shall receive an hourly wage rate of his regular hourly wage plus \$5.00 per hour. An operating engineer working at a hazardous waste removal project or site at a task requiring hazardous waste related certification, but who is not working in a zone requiring level A, B, or C personal protection, shall receive an hourly wage rate of his regular rate plus \$ 1.00 per hour. This shall also apply to sites where the level D personal protection is required.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 34.35
------------	----------

OVERTIME PAY

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

*15% premium is also required on shift work benefits

HOLIDAY

Paid: See (5, 6, 10, 13, 15) on HOLIDAY PAGE

Overtime: See (5, 6, 10, 13, 15) on HOLIDAY PAGE

Holidays falling on Sunday will be celebrated on Monday.

REGISTERED APPRENTICES

(1) year terms at the following percentage of journeyman's wage.

1st 60%	2nd 70%	3rd 80%	4th 90%
------------	------------	------------	------------

Supplemental Benefits per hour:

Apprentices \$ 34.45

11-825SE

Painter

11/01/2020

JOB DESCRIPTION Painter

DISTRICT 1

ENTIRE COUNTIES

Columbia, Dutchess, Greene, Orange, Sullivan, Ulster

WAGES

Per hour

07/01/2020

Brush/Paper Hanger	\$ 35.14
Dry Wall Finisher	35.14
Lead Abatement	35.14
Sandblaster-Painter	35.14
Spray Rate	36.14

See Bridge Painting rates for the following work:

Structural Steel , all work performed on tanks, ALL BRIDGES, towers, smoke stacks, flag poles. Rate shall apply to all of said areas from the ground up.

SUPPLEMENTAL BENEFITS

Per hour

Journey person \$ 24.04

OVERTIME PAY

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

THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED SHIFT(S) OR SINGULAR IRREGULAR SHIFT OF AT LEAST A FIVE (5) DAY DURATION (MONDAY THROUGH FRIDAY), WHEN THE SHIFT STARTS BETWEEN THE HOURS LISTED BELOW:

4:00 PM to 6:30 AM REGULAR RATE PLUS 15%**

OVERTIME ON MULTIPLE SHIFT WORK AND SINGULAR IRREGULAR SHIFT THE SHIFT RATE IS THE BASE RATE

**SHIFT RATE STOPS AFTER 6:30AM

HOLIDAY

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

REGISTERED APPRENTICES

Wages per hour

Six (6) month terms at the following percentage of Journey person's wage

1st 40%	2nd 50%	3rd 60%	4th 70%	5th 80%	6th 90%
------------	------------	------------	------------	------------	------------

Supplemental Benefits per hour worked

1st term \$ 10.64
All others 24.04

1-155

Painter - Bridge & Structural Steel

11/01/2020

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	\$ 20.60	\$ 21.20
	+ 3.15*	+ 3.45*	+ 3.86*
2nd year	\$ 30.15	\$ 30.90	\$ 31.80
	+ 4.73*	+ 5.18*	+ 5.78*
3rd year	\$ 40.20	\$ 41.20	\$ 42.40
	+ 6.30*	+ 6.90*	+ 7.71*
Supplemental Benefits - Per hour:			
1st year	\$.25	\$.25	\$.25
	+ 11.86*	+ 12.00*	+ 12.24*
2nd year	\$ 10.20	\$ 10.90	\$ 10.90
	+ 17.79*	+ 18.00*	+ 18.36*
3rd year	\$ 10.20	\$ 10.90	\$ 10.90
	+ 23.72*	+ 24.00*	+ 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	11/01/2020
--------------------------------	-------------------

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
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	11/01/2020
---------------------------------	-------------------

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

11/01/2020

JOB DESCRIPTION Plumber

DISTRICT 11

ENTIRE COUNTIES

Orange, Rockland, Sullivan

PARTIAL COUNTIES

Ulster: Only the Townships of Plattekill, Marlboro, Wawarsing, and Shawangunk (except for Wallkill and Shawangunk Prisons).

WAGES

REFRIGERATION: For commercial and industrial refrigeration which means service, maintenance, and installation work where the combined compressor tonnage does not exceed 40 tons.

AIR CONDITIONING: Air conditioning to be installed that is water cooled shall not exceed 25 tons. This will include the piping of the component system and erection of water tower. Air conditioning that is air cooled shall not exceed 50 tons.

WAGES: (per hour)

	07/01/2020	05/01/2021 Additional
Plumber	\$ 34.59	\$ 2.00

Star Certification: an additional \$ 1.00 per hour over scale will be paid to all those who have Star Certification.

Shift Differential: When mandated by the governmental agency, an additional 15% premium will be paid for irregular work day or for 2nd and 3rd shift.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman

\$ 33.07*

*For overtime or shift differential work, \$0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

OVERTIME PAY

See (B, G, P, *V) on OVERTIME PAGE

* A portion of the benefit amount is subject to the V code for overtime and shift differential work.

HOLIDAY

Paid: See (5, 6, 13, 15, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 13, 15, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1)year terms at the following wage.

	07/01/2020
1st term	\$ 12.11
2nd term	15.57
3rd term	19.03
4th term	22.49
5th term	27.68

Supplemental Benefits per hour:
Apprentices

1st term	\$ 11.66*
2nd term	14.96*
3rd term	18.25*
4th term	21.55*
5th term	26.49*

*For overtime or shift differential work, \$0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

11-373 Refrig

Plumber	11/01/2020
---------	------------

JOB DESCRIPTION Plumber

DISTRICT 11

ENTIRE COUNTIES

Orange, Rockland, Sullivan

PARTIAL COUNTIES

Ulster: Only the Townships of Plattekill, Marlboro, Wawarsing, and Shawangunk (except for Wallkill and Shawangunk Prisons).

WAGES

WAGES:(per hour)	07/01/2020	05/01/2021 Additional
Plumber/Steamfitter	\$ 46.70	\$ 2.50

Note: For all work 40-60 feet above ground add \$ 0.25 per hour, over 60 feet add \$ 0.50 per hour.

Shift Differential: When mandated by the governmental agency, an additional 15% premium will be paid for irregular work day or for 2nd and 3rd shift.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman

\$ 40.82*

*For overtime or shift differential work, \$0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

OVERTIME PAY

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

* A portion of the benefit amount is subject to the V code for overtime and shift differential work.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16) on HOLIDAY PAGE

When a holiday falls on a Saturday, the day prior shall be considered and recognized as the holiday. When a holiday falls on a Sunday, the day proceeding shall be considered and recognized as the holiday to be observed.

REGISTERED APPRENTICES

(1) year terms at the following wages.

	07/01/2020
1st term	\$ 16.35
2nd term	21.02
3rd term	25.69
4th term	30.36
5th term	37.36

Supplemental Benefits per hour:

1st term	\$ 14.37*
2nd term	18.44*
3rd term	22.50*
4th term	26.58*
5th term	32.67*

*For overtime or shift differential work, \$0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

11-373 SF

Roofer

11/01/2020

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

11/01/2020

JOB DESCRIPTION Sheetmetal Worker

DISTRICT 8

ENTIRE COUNTIES

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

WAGES

SheetMetal Worker 07/01/2020
\$ 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

Sprinkler Fitter

11/01/2020

JOB DESCRIPTION Sprinkler Fitter

DISTRICT 1

ENTIRE COUNTIES

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

WAGES

Per hour

07/01/2020

Sprinkler \$ 45.52
Fitter

SUPPLEMENTAL BENEFITS

Per hour

Journeyperson \$ 27.57

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 journeyperson'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

11/01/2020

JOB DESCRIPTION Teamster - Building / Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Dutchess, Orange, Rockland, Sullivan, Ulster

WAGES

GROUP 1: LeTourneau Tractors, Double Barrel Euclids, Athney Wagons and similar equipment (except when hooked to scrapers), I-Beam and Pole Trailers, Tire Trucks, Tractor and Trailers with 5 axles and over, Articulated Back Dumps and Road Oil Distributors, Articulated Water Trucks and Fuel Trucks/Trailers, positions requiring a HAZMAT CDL endorsement.

GROUP 1A: Drivers on detachable Gooseneck Low Bed Trailers rated over 35 tons.

GROUP 2: All equipment 25 yards and up to and including 30 yard bodies and cable Dump Trailers and Powder and Dynamite Trucks.

GROUP 3: All Equipment up to and including 24-yard bodies, Mixer Trucks, Dump Crete Trucks and similar types of equipment, Fuel Trucks, Batch Trucks and all other Tractor Trailers, Hi-Rail Truck.

GROUP 4: Tri-Axles, Ten Wheelers, Grease Trucks, Tillerman, Pattern Trucks, Attenuator Trucks. Water Trucks, Bus.

GROUP 5: Straight Trucks.

GROUP 6: Pick-up Trucks for hauling materials and parts, and Escort Man over-the-road.

WAGES: (per hour) 07/01/2020

GROUP 1	\$ 33.25
GROUP 1A	34.39
GROUP 2	32.69
GROUP 3	32.47
GROUP 4	32.36
GROUP 5	32.24
GROUP 6	32.24

NOTE ADDITIONAL PREMIUMS:

- On projects requiring an irregular shift a premium of 10% will be paid on wages. The premium will be paid for off-shift or irregular shift work when mandated by Governmental Agency.
- Employees engaged in hazardous/toxic waste removal, on a State or Federally designated hazardous/toxic waste site, where the employee comes in contact with hazardous/toxic waste material and when personal protective equipment is required for respiratory, skin, or eye protection, the employee shall receive an additional 20% premium above the hourly wage.

SUPPLEMENTAL BENEFITS

Per hour:

First 40 hours	\$ 35.55
Over 40 hours	28.75

OVERTIME PAY

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

*Holidays worked Monday through Friday receive Double Time (2x) after 8 hours.

**Sunday Holidays are paid at a rate of double time and one half (2.5x) for all hours worked.

HOLIDAY

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

Overtime: See (*1) on HOLIDAY PAGE

*See OVERTIME PAY section for when additional premium is applicable on Holiday hours worked.

11-445B/HH

Welder

11/01/2020

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 CROPEY 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

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

Article 8

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 CJ-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

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

Article 8

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 REPAIR 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

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

Article 8

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

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

Article 8

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 STREETSYRACUSE 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 HIGHWAYROCKVILLE CENTRE NY 10457	04/07/2016	04/07/2021
DOL	DOL		J.A. HIRES CADWALLADER		P.O BOX 100 200 LATTA BROOK PARKHORSEHEADS 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 HIGHWAYROCKVILLE 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 799HILTON 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 AVENUEOSWEGO 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 LATTA 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 LATTA BROOK PARKHORSEHEADS 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 296EAST AURORA NY 14052	07/29/2015	07/29/2020
DOL	DOL		JON E DEYOUNG		261 MILL RD P.O BOX 296EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	DOL		JORI PEDERSEN		415 FLAGER AVE #302STUART 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 HIGHWAYROCKVILLE CENTRE NY 10457	04/07/2016	04/07/2021
DOL	NYC		JOSEPH FOLEY		66-05 WOODHAVEN BLVD. STE 2REGO 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 MONSEY NY 10952	11/20/2002	11/20/3002

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

Article 8

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 GILLET 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

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

Article 8

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 BROOKLYN NY 11229	09/24/2012	09/18/2020

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

Article 8

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

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

Article 8

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 BISSEAR		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, LLC		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023

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

Article 8

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 NWLANTA 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	VIALE 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 DOUGLSTON 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 CROPSY AVE BROOKLYN NY 11214	10/30/2018	10/30/2023

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

Article 8

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

SECTION 010000 - GENERAL CONDITIONS

1.1	Definitions:	3
1.2	Initial Submittals:	4
1.3	Visit to Site:	4
1.4	Materials Handling:	4
1.5	Security and Safety:	5
1.6	Supervision:	5
1.7	Installation:	5
1.8	Time of Completion:	5
1.9	Existing Work:	6
1.10	Existing Equipment:	6
1.11	Equivalents/Substitutions:	6
1.12	Warranty/Guarantee:	6
1.13	Communications:	7
1.14	Protection:	7
1.15	Removal and Disposal of Debris:	7
1.16	Ingress, Egress, and Circulation:	8
1.17	Non-Interference with Owner's Operations:	8
1.18	Architect/Engineer's Inspections:	9
1.19	Compliance, Permits and Inspections:	9
1.20	Submittals - Shop Drawings, Product Data, and Samples:	9
1.21	Schedule of Values:	13
1.22	Project Coordination:	15
1.23	Openings, Channels, Cutting and Patching:	15
1.24	Construction Progress Schedule:	16
1.25	Protection of Work and Property:	17
1.26	Emergencies:	18
1.27	Temporary Controls:	18

1.28	Changes in the Work:.....	18
1.29	Application for Payment:	26
1.30	Contract Closeout:	28
1.31	Cleaning:	31
1.32	Project Record Documents:	32
1.33	Operation & Maintenance Data:.....	34
1.34	Contractor Assumption of Liability:	34
1.35	Lien Interest in Materials and Supplies:	34

1.1 Definitions:

Unless otherwise noted, the following definitions apply throughout all Contract Documents:

1. "Architect/Engineer" means the entity identified as the "Architect" in Division 01 Section 011000 – Summary of Work.
2. "Business Day" means a Calendar Day excluding weekends and holidays
3. "Calendar Day" or "Day" means all days including weekends and holidays.
4. "Contractor" means the entity holding a Public Improvement Contract with the Owner for this Project.
5. The "Contract" consists of the Contract Documents. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a written Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect/Engineer and a Contractor or a Subcontractor of any tier, (2) between the Owner and a Subcontractor of any tier or (3) between any persons or entities other than the Owner and Contractor. The Architect/Engineer shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect/Engineer's duties.
6. "Contract Documents" consist of the Public Improvement Contract; all documents in the Request for Bid including, but not limited to, all Drawings and Specifications; the Contractor's Bid, Addenda issued prior to execution of the Contract; other documents listed in the foregoing documents (unless otherwise excluded); and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect/Engineer. Shop Drawings and Submittals are not Contract Documents.
7. "Contract Sum" means the total not-to-exceed cost specified in the Contract Documents.
8. "Day" means Calendar Day unless otherwise specifically defined.
9. "Drawings" means the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.
10. "Owner" means the entity designated as "Owner" in Division 01 Section 011000 – Summary of Work.
11. "Project" means the total construction project including the Work performed under all Contractor's Contracts and which may include goods or services provided by the Owner or by separate contractors, vendors or consultants.
12. The word "provide", with respect to constructed items, equipment and materials, means completely furnish and install.
13. "Site" means the location of the "Project Identification" provided in Division 01 Section 011000 - Summary of Work.
14. "Specifications" mean that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

15. "Subcontractor" means subcontractors, of every tier, performing Work which is the responsibility of Contractor.

16. "Supplier" means entities, of every tier, supplying materials or services to Contractor to complete its Work for this Project.

17. "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

18. "Working Day" means a day the Contractor's crew is typically performing Work for this Project which may include some non-Business Days (e.g. if the Project work schedule is Monday-Saturday).

1.2 Initial Submittals:

1. A Construction Progress Schedule shall be submitted to the Architect/Engineer by the Contractor within Ten (10) Days of issuance of Notice to Proceed and shall be adhered to at all times. Any deviation from the Construction Progress Schedule shall be brought to the immediate attention of the Architect/Engineer, and an updated Construction Progress Schedule shall be provided at that time.

2. Within Ten (10) Days of issuance of Notice to Proceed, the Contractor shall submit to the Architect/Engineer for approval (4) copies of a list of materials, with trade names, proposed to be furnished and Shop Drawings as requested by the Architect/Engineer and in accordance with §1.28 of these General Conditions and Division 01 Section 013300 - Submittal Procedures. Submittals shall be representative of materials to be used by the Contractor in completing its Work.

1.3 Visit to Site:

1. The Contractor shall examine the Drawings and Specifications; must visit the Site and note all Field Conditions which will influence the Work required by its Contract prior to bidding.

2. The Contractor must verify the data noted in the Drawings and Specifications. Contractor shall report any discrepancies between the bid documents and the field conditions to the Architect/Engineer during the Question period of the Bid so that the Architect/Engineer may issue clarification addenda if required. Failure to report any discrepancies within the time frame noted, will nullify any extra cost claim by the Contractor, if claim is based on discrepancies between Specifications, Drawings, and field conditions.

1.4 Materials Handling:

1. Delivery: The Contractor shall be responsible for all materials being delivered in manufacturer's original unopened containers with manufacturer's labels intact and legible.

2. Storage: Storage space for materials and equipment is considered limited and the Contractor will schedule deliveries to minimize space required for storage. The Contractor shall place and store materials and equipment in spaces agreed upon by the Owner, Architect/Engineer, and Contractor. The Contractor shall provide continuous protection against damage or loss for all materials (including those of Subcontractors and Suppliers) prior to final incorporation into the Work.

3. Waste Materials: All waste materials shall be stored and removed daily from the Site in a manner agreed upon by the Contractor, the Owner, and the Architect/Engineer. In the event material and debris are left at the Site and not removed in accordance with the Specifications, the Owner may remove the offending materials at the Contractor's expense.

1.5 Security and Safety:

1. The Contractor shall maintain adequate security at all times to protect the materials and Work in place from damage, theft, malicious mischief and vandalism.
2. The Contractor shall also observe and comply with all codes and regulations applicable to the safety of employees, tenants, and the general public.
3. The Contractor shall meet all applicable requirements of federal and New York State Occupational Safety and Health laws and regulations as related to the Work.
4. All Work shall be performed with the safety of the building occupants, including but not limited to tenants, employees, students, staff, visitors and the general public taken into consideration.

1.6 Supervision:

1. All Work shall be carried out under the direction of the Architect/Engineer and with the approval of the Owner with the least interference with the routine use of the building.
2. All materials, equipment, etc., shall be stored where and as directed.
3. The Owner shall determine the compliance with the terms of the Contract Documents based upon same and Owner's decision shall be final and conclusive as to the intent of the Specifications and the sufficiency in quality and quantity of any Work performed or material furnished in connection with the Work covered by the Specifications. The Architect/Engineer shall assist and advise the Owner as necessary.

1.7 Installation:

In addition to the requirements of §3.05 for Installation under Division 01 Section 017300 – Execution Requirements, Contractor is responsible for the following:

1. The Contractor is responsible for complete and fully functioning installation of all Work in accordance with current industry standards. Any services, equipment, materials or supplies not indicated in Specifications or Drawings to allow complete installation shall be brought to Architect/Engineer's and Owner's attention during the Question period of the Bid. Additional costs for anything necessary and not indicated during the Question period shall not be allowed and shall be assumed as included in Contractor's bid price.
2. The complete installation shall be in accordance with the latest rules and regulations of all authorities having jurisdiction.
3. Any item or requirement necessary for a complete installation but not specifically described in this Specification shall conform to the governing rules and regulations.
4. The Contractor shall procure all the necessary and usual certificates for all Work installed by it or its Subcontractors and Suppliers and deliver same to the Architect/Engineer before final acceptance by Owner.
5. The Contractor is responsible for all rigging, scaffolding, and hoisting that is required to install the equipment as specified.

1.8 Time of Completion:

1. Time of Completion shall be as indicated in Table 1-1 of these General Conditions.

2. The Contractor, in preparing its Construction Progress Schedule, shall comply with the requirements of Table 1-1 which lists the total weeks for completion from the date of issuance of Notice to Proceed.

3. Any objections by a prospective Bidder to the Project Schedule indicated in Table 1-1 shall be submitted during the Question period for the Bid as well as indicated on the Bid Form with submittal of Bid.

1.9 Existing Work:

1. Existing Work shall be cut, drilled, altered, removed or temporarily removed and replaced as necessary for the performance of the Contract. However, unless otherwise provided by the Specifications, no structural members shall be cut or altered without the authorization of the Architect/Engineer.

2. Work remaining in place which is damaged or defaced by reason of Work as done under this Contract, shall be restored equal to its condition at the time of the award of this Contract.

1.10 Existing Equipment:

Equipment temporarily removed as a result of Work under this Contract shall be protected, cleaned, and replaced equal to its condition at the time of the award of this Contract.

1.11 Equivalents/Substitutions:

1. Equivalents: When a product or material is specified by name, as noted in these Specifications, such Specification establishes the standard type and quality considered most satisfactory for the particular purpose and the Bid therefore should be based upon the same or substituted (in accordance with the procedure below) approved equal, so that all Bid under the same conditions.

2. Substitutions: Another product or material of the same type and meeting the requirements may be submitted for consideration as a substitute only under the following conditions:

a. If a Bidder intends to offer substitution of the product specified, such intentions must be clearly stated in the Bid. Bidder must prove equivalence of substitution and furnish detailed specifications and catalog cuts or drawings. Failure to identify exceptions or deviations from equipment specified must be interpreted to indicate that the product offered complies with the Specification in every respect.

b. Requests for substitution must be submitted during the Question period of the Bid. All Bidders will, in turn, be notified if the proposed substitutes will be approved prior to the receipt of Bids. Bids must be submitted with approved Submittals.

1.12 Warranty/Guarantee:

1. By execution of the Contract, Contractor warrants and guarantees all labor and materials for a period of one (1) year from the date of Final Completion, which shall include repairing and making good, at Contractor's own expense, any and all defects, which may appear in the Work.

2. Where special warranties or guarantees covering installation, operation, or performance of any systems or appliances furnished under this Contract for this Work are required by the Contract Documents, documentation indicating Contractor's full responsibility for the fulfillment of such warranties or guarantees, shall be provided in triplicate, including for materials and services provide by any and all Subcontractors and Suppliers, two (2) copies of which shall be filed with the Architect/Engineer before Final Completion.

1.13 Communications:

Should there be any problems with the Contract including but not limited to: working conditions, cooperation of the Owner personnel, tenants, vandalism, job safety, stolen equipment and materials, or unusual field conditions; the Contractor will immediately notify the Architect/Engineer and the Owner in writing for resolution by the Architect/Engineer and the Owner.

1.14 Protection:

Contractor shall:

1. Be responsible for protecting the existing building, new Work, new facilities, and all improvements within the area where Work is being accomplished. Any damage resulting directly or indirectly from the Contractor's operations, including operations of Subcontractors and Suppliers, shall be promptly corrected at the Contractor's expense.
2. Provide all necessary temporary enclosures, covers, guardrails, barricades, safety devices, etc., to adequately protect all workmen and the public, especially children, from possible injury due to the various processes required to accomplish the Work required.
3. Provide all necessary temporary partitions, enclosures, and coverings for the confinement of dust, dirt, and debris.
4. Temporarily protect partially completed construction items such as structural steel, roof deck, roofing, insulation, exposed wall cavities, interior walls, etc., as needed to protect against weather damage.
5. Provide all required protective measures for removal Work. Give particular attention to the protection requirements so as to prevent any damage to existing construction or to adjoining public and private property, including thoroughfares. The Contractor will be held responsible and shall restore, at its own expense, any such damage to the complete satisfaction of the Architect/Engineer.
6. Protect adjoining public and private property, including thoroughfares, from damage due to disposal operations.
7. Protect from damage all heating, plumbing, and electrical lines to remain.
8. Take extreme care to protect the occupants of adjoining areas and prevent any harm to them through the required operations.

1.15 Removal and Disposal of Debris:

1. Contractor is responsible for removal from the building and Site, through legal off-Site disposal, of all rubble, trash, combustible materials and debris of all kinds created by the Work for this Project. This includes all debris created by or connected with the operations of Contractor, Subcontractors and Suppliers engaged in the Work.
2. Contractor shall pay all costs, fees, and permits attendant to the loading, unloading, cartage, dumping and disposal of all waste and debris. No Subcontractor or Supplier shall be obliged to pay any costs attendant to this operation. The complete removal of all waste and debris shall be performed with such frequency as to maintain the grounds around the building free from waste and debris. Waste and debris removed will be loaded directly into waiting trucks or containerized vehicles so as not to litter the adjacent grounds.

3. In addition, the Site will be maintained in a clean and orderly manner to conform with all local fire safety regulations and in accordance with the latest editions of the Safety Code of the National and State Board of Fire Underwriters.

4. Areas designated by Architect/Engineer will be the only place the Contractor will be allowed to load and unload usable materials, waste and/or debris. Contractor shall ensure that at no time the fire exists of the building are blocked.

5. Contractor will further repair any damage done to the sidewalks, pavements, and lawn areas upon completion of the Project.

1.16 Ingress, Egress, and Circulation:

1. Contractor shall be responsible for performing the Work in such manner to maintain essential ingress and egress for visitors and occupants of Owner-occupied areas and to continuously maintain all required emergency exits from and circulation between existing facilities.

2. Passageways for emergency exits shall be kept continuously free from debris, construction equipment, tools, stockpiles of materials, and other hazards to speedy evacuation.

3. Contractor shall provide all necessary temporary Work as prudence and good practice may dictate and in accordance with federal and New York State laws and regulations, to obtain and maintain all such ingress, egress, and circulation requirements. All temporary Work shall be removed by Contractor, at its expense, when no longer required.

1.17 Non-Interference with Owner's Operations:

1. Contractor shall acquaint itself with the general character of the Owner's operations prior to commencing Work and shall schedule Work to avoid interference with Owner's operations.

2. The sequence of demolition and removal operations shall be in accordance with a Construction Progress Schedule approved by the Owner and Architect/Engineer.

3. An approved Construction Progress Schedule will be established for the Work, per §1.34 of these General Conditions, that will not interfere with the Owner's operations. The Construction Progress Schedule may be modified from time to time by the Owner if changes in Owner's schedule of activities require it.

4. The Owner will occupy the existing building and the outdoor facilities and grounds during normal business hours and also for after-hours activities. There will be outdoor building activities during active construction.

5. Emergency exit ways shall be kept clear at all times that people are in the building.

6. It shall be the responsibility of Contractor to provide sufficient supervision of vehicles of Contractor, Subcontractors and Suppliers, accessing the construction Site. Any construction vehicle traffic must be supervised by a designated responsible representative of the Contractor.

7. The Contractor's and Subcontractor's use of the premises is restricted to the areas involved in the Work.

8. Telephone facilities of the Owner are not at the disposal of the construction personnel.

9. The Owner is not responsible for any materials, tools, or equipment of the Contractor, Subcontractors or Suppliers.

10. All streets and all drive areas throughout and adjacent to the property must be kept free of obstructions.

1.18 Architect/Engineer's Inspections:

1. Contractor shall accommodate Architect/Engineer's inspections by providing manpower, equipment, etc. as required by the inspector.
2. Contractor shall assist the inspector as requested.

1.19 Compliance, Permits and Inspections:

1. Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for all applicable permits, fees, licenses and inspections necessary for proper execution and completion of the Work.
2. Tests and inspections shall be made in the presence of representatives of authorities having jurisdiction as may be applicable pursuant to federal or New York State laws or regulations.
3. The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of authorities having jurisdiction applicable to performance of the Work.
4. All Work is to be done in accordance with all applicable and current federal, New York State and local codes, including, but not limited to, New York State Building Codes, NFPA 101 Life Safety Code, and ADA Standards for Accessible Design. No Work requiring inspections and approvals of construction code officials is to be covered or enclosed prior to inspection and approval by appropriate code enforcement officials.
5. It is the Contractor's responsibility to ascertain that the Contract Documents are in accordance with the current version of all applicable laws, statutes, ordinances, building codes, rules and regulations. However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Architect/Engineer and Owner, in writing, and necessary changes shall be accomplished by appropriate modifications.
6. If the Contractor performs Work knowing it to be contrary to current applicable laws, statutes, ordinances, building codes, rules or regulations without such notice to the Architect/Engineer and Owner; the Contractor shall be responsible for correcting all such Work and shall be responsible for all resulting costs, losses or damages.
7. Prior to the start of any crane equipment operations, each Contractor shall make all necessary applications and obtain all required permits from the Federal Aviation Administration (FAA). The sequence of operations, timing and methods of conducting the Work shall be approved by the FAA to the extent that it relates to their jurisdiction.
6. Contractor shall supply the Architect/Engineer and Owner, within Two (2) Business Days of issuance, One (1) copy each of all permits, licenses, inspection reports, releases, jurisdictional settlements, notices and related documents.

1.20 Submittals - Shop Drawings, Product Data, and Samples:

1. Work Included:
 - a. Submit to Architect/Engineer, all Shop Drawings, Product Data, and samples as required by the Specifications.

- b. Designate Construction Progress Schedule dates for submission and dates that Shop Drawings reviews, Product Data and Samples will be needed for each product.
- c. Contractor must stamp all Submittals with "approval stamp" before submitting to the Architect/Engineer.

2. Shop Drawings:

- a. Original Drawings prepared by Contractor, Subcontractor, Supplier or distributor, which show some portion of the Work, showing fabrication, layout, setting, or erection of details.
- b. Prepared by qualified details.
- c. Identify details by reference.
- d. Reproduction of Submittals to be opaque diazo prints or blueprints.

3. Product Data:

- a. Manufacturer's Standard Schematic Drawings:
 - i. Modify Drawings to delete information which is not applicable to the Project.
 - ii. Supplement standard information to provide additional information applicable to Project.
- b. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
 - i. Clearly mark each copy to identify pertinent materials, products or models.
 - ii. Mark each item with the appropriate Specification reference.
 - iii. Show dimensions and clearances required.
 - iv. Show performance characteristics and capacities.
 - v. Show wiring diagrams and controls.
 - vi. Indicate any deviations for characteristics specified clearly.

4. Samples:

- a. Where called for in Specifications or required by Architect/Engineer provide physical examples to illustrate materials, equipment or workmanship and to establish standards by which completed Work is judged.
- b. Provide Samples of sufficient size and quantity to clearly illustrate:
 - i. Functional characteristics of products or material with integrally related parts and attachment devices.
 - ii. Full range of color Samples.
 - iii. After review Samples may be used in construction of the Project.

c. Clearly identify each Sample with appropriate Specification reference and clearly indicate any deviation from Specification.

5. Contractor's Responsibilities:

a. Review Shop Drawings, Product Data, and Samples prior to submission, make certain that items conform to Specifications and requirements of Work, and so certify when submitting items for approval.

b. Verify:

- i. Field measurements;
- ii. Field construction criteria;
- iii. Catalog numbers and similar data.

c. Coordinate each Submittal with requirements of Work and of Contract Documents.

d. Contractor's responsibility for errors and omissions in Submittals is not relieved by Architect/Engineer's review of the Submittals.

e. Contractor's responsibility for deviations in Submittals from requirements of Contract Documents is not relieved by Architect/Engineer's review of Submittals, unless Architect/Engineer deviations are identified by Contract at time of submission.

f. Notify Architect/Engineer, in writing, at the time of submissions or deviations in Submittals from requirements of Contract Documents.

g. No Work, which requires Submittals, shall begin until return of Submittals with Architect/Engineer's stamp and initials or signature indicating review and approval.

h. After Architect/Engineer's review, distribute copies as needed.

6. Submission Requirements:

a. Submittal schedule for Shop Drawings, Product Data, and Samples shown:

- i. Date of Contractor's Submittals;
- ii. Date of Contractor's Resubmittals;
- iii. Date of approval;
- iv. Date of release of Work Order or Purchase Order.

b. Schedule submissions at least Ten (10) Days before dates reviewed Submittals will be needed.

c. Submit number of copies of Shop Drawings and Product Data Samples which Contractor requires for distribution and manuals, Three (3) copies which will be retained by Architect/Engineer and Two (2) copies for Owner.

d. Submit number of Samples specified in each of the Specification Sections.

- e. Accompany Submittals with transmittal letter in duplicate, containing:
 - i. Date;
 - ii. Project title and number, and Contract number;
 - iii. Contractor's name and address;
 - iv. Number of each Shop Drawing, Product Data, and Sample; and quantity of Drawings submitted;
 - v. Notification of deviations from Contract Documents;
 - vi. Other pertinent data.
- f. Submittals shall include:
 - i. Data and revision dates;
 - ii. Project title and number;
 - iii. The names of:
 - A. Architect/Engineer
 - B. Contractor
 - C. Subcontractor
 - D. Supplier
 - E. Manufacturer
 - F. Separate details, when pertinent.
 - iv. Identification of product or material;
 - v. Relation to adjacent structure or materials;
 - vi. Field dimensions, clearly identified as such;
 - vii. Specification Section numbers;
 - viii. Applicable standards, such as ASTM number or Federal Specification;
 - ix. Identification of deviation from Contract Documents;
 - x. Contractor's stamp, initialed or signed, certifying to review of Submittal; verification of field measurements and compliance with Contract Documents.

7. Architect/Engineer's Review:

- a. Architect/Engineer will review and stamp submitted Shop Drawings and other submissions in one (1) of the following ways:

- i. "NO EXCEPTIONS TAKEN": Submission is in full compliance with all Contract Documents, or indicated deviations are acceptable.
 - ii. "MAKE CORRECTIONS NOTED": Submission has minor corrections not significant enough to require resubmission; noted corrections must be made in the final installation.
 - iii. "REJECTED": Submission does not meet Contract requirements; resubmission of Shop Drawings, which meet Contract requirements, is required.
 - iv. "AMEND AND RESUBMIT": Resubmission is required due to the nature and/or number of corrections.
- b. Work shall be executed in accordance with "No Exception Taken" or "Make Corrections Noted" Drawings only.
- c. Architect/Engineer's approval is for conformity to design requirements and arrangement only. Contractor is responsible for quantity, dimension, accuracy of fit, and coordination with other trades. Approval is subject to all Contract requirements and does not authorize any changes involving additional costs, unless stated in a separate Change Order.

8. Resubmission Requirements:

a. Shop Drawings:

- i. Revise initial Drawings, as required, and resubmit, as specified to initial Submittal;
- ii. Indicate on Drawings any changes, which have been made, other than those requested by Architect/Engineer;
- iii. Submit new Product Data and Samples, as required on initial submission.

9. Distribution of Submittals After Review:

- a. Distribute copies of Shop Drawings and Product Data, which carry Architect/Engineer's stamp to:
- i. Contractor's File;
 - ii. Job Site File;
 - iii. Record Document File;
 - iv. Subcontractors;
 - v. Supplier;
 - vi. Fabricator.
- b. Distribute Samples as directed; remove from Site if so placed or incorporated in finished Work when permitted by Architect/Engineer.

1.21 Schedule of Values:

1. Work Included:

Interior Renovations
Village of Woodbury Building Department
Highland Mills, NY

010000-13

#4.1523.01

- a. Submit to Architect/Engineer the Schedule of Values, within Seven (7) Days after issuance of Notice to Proceed.
- b. Upon request of Architect/Engineer, support values given with data that will substantiate their correctness.
- c. List quantities of materials specified under Unit Price allowances.
- d. Payment for materials stored on Site will be limited to those materials listed in Schedule of Values.
- e. Use Schedule of Values only as basis for Contractor's Application for Payment.

2. Submittals:

Form and Content:

- a. Submit typewritten Schedule of Values on AIA G703 (Continuation Sheet to G702).
- b. Use Table of Contents of this Specification as basis for format of listing costs of Work for Sections under Divisions applicable to Contract.
- c. Identify each line item with Section number and title, as listed in Table of Contents of these Specifications.

3. Preparation:

- a. Itemize separate line item cost for each of the following general cost items:
 - i. Insurance, performance, and payment bonds;
 - ii. Field supervision and layout;
 - iii. Temporary Facilities and Controls;
 - iv. Mobilization;
 - v. Performance testing (not less than 10% of value of equipment/system being tested);
 - vi. Allowances.
- b. Payment for field supervision, layout, and Temporary Facilities, and Controls will be made monthly as a percentage of Project completion corresponding directly to the percent of total dollar value of the Work owed (does not include retainage).
- c. Contractor shall submit applications for payment by the Tenth (10th) Day of each month for the previous month's Work.
- d. Itemize separate line item cost for Work required by each Section of the Specifications.
- e. Provide line item for each major component of Work for which Contractor will require Partial Payment or where so requested by the Architect/Engineer.

4. Review and Submittal:

- a. After review by Architect/Engineer and Owner, revise and resubmit Schedule of Values, as required.
- b. Schedule of Value(s) which are "front-loaded" will be rejected.

1.22 Project Coordination:

In addition to the requirements of Division 01 Section 013100 - Project Management and Coordination, Contractor shall:

1. Have the responsibility for being the supervisor, manager, overseer, coordinator, and expeditor of all its Subcontractors, of every tier, and Suppliers and of the total construction process and all of its parts, in accordance with the Contract. In executing the duties assumed by these responsibilities, the Contractor shall provide sufficient executive and supervisory staff in the field to accomplish efficient and expeditious handling of these matters. There shall be at least one (1) full-time Project Manager assigned by the Contractor, as well as the field staff referred to above. The Project Manager shall attend each Progress Meeting at the Site.
2. Afford the Owner and others reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their Work. Contractor shall coordinate its Work with other contractors, consultants or suppliers of Owner, so that no portion of the Work is delayed or not properly undertaken due to such lack or failure of cooperation.
3. Lay out and install its Work at such time or times, and in such manner, as to facilitate the general progress of the Project.
4. Coordinate all Work with the Owner. Working hours shall be scheduled during the hours of 7:00 a.m. and 3:30 p.m. during normal Working Days, Monday through Friday.
5. Not interfere with the operation of existing essential services during all normal operating hours and periods of Owner and tenants. All Work requiring temporary interruption of essential services shall be done only with the specific approval of the Architect/Engineer and Owner. The Contractor shall provide, for approval by the Owner and the Architect/Engineer, notice of any Work affecting existing services.
6. Provide Twenty-Four (24) hours' advance notice to the Architect/Engineer and Owner for those areas where access would be required the next Working Day.
7. Be responsible for all overtime costs of Owner employees resulting from and/or as requested by the Contractor(s) which shall be chargeable to the Contractor.
8. Provide separate access to the construction area, as required, while construction is on-going. The Contractor will provide, as required, temporary stairs, scaffolding, doors, etc. to provide separate access for all trades to the construction areas.

1.23 Openings, Channels, Cutting and Patching:

1. Contractor shall be responsible for furnishing and setting of sleeves, built-in items, anchors, inserts, etc. for its Work and for all cutting, fitting, closing in, patching, finishing, or adjusting of its Work in new and/or existing construction, as required for the complete installation. Where applicable, the Contractor shall build these items into the construction.
2. The Contractor shall build recesses, channels, chases, openings, flues, and ducts, or any other feature of the heating and ventilating Work.

3. The Contractor shall provide openings for all louvers.
4. Openings in masonry walls shall be lintels provided and installed by the Contractor.
5. All Subcontractors, of every tier, requiring recesses, channels, chases, openings, etc. shall furnish to the Contractor, through the Architect/Engineer, complete detailed Drawings for all chases, openings required in connection with some Work in ample time to allow the Work to proceed without interruption or delay. At least Three (3) copies shall be furnished to the Architect/Engineer.
6. The Contractor shall close, build in, and furnish around or over all openings, chases, channels, pockets, etc. after installation has been completed.
7. Approval in writing must first be obtained by the Contractor from the Architect/Engineer before cutting or boring through a floor beam, floor construction or members.
8. Repair of Finished Surfaces: The Contractor accepts sole responsibility for repair of uncontrolled dislodgment, cracking, delamination, rusting, and peeling of finished surfaces such as stainless steel, concrete, precast concrete, cast and natural stone, masonry, millwork, plaster, glass and applied finishes such as paint, and special coatings, within the Contract scope and the limits of specified Guarantee and Warranty periods, regardless of the cause.
9. The Contractor shall be responsible for replacement of all broken glass installed as required for completion of its Work, after same has been installed, no matter by whom or what cause, and shall replace all broken, scratched, or otherwise damaged glass before the completion and acceptance of the Work. Contractor shall wash all glass on both sides at completion, or when directed, removing all paint spots, stains, plaster, etc.
10. Nothing herein is intended to limit the right of the Contractor to seek payment from the party who is responsible for damages.

1.24 Construction Progress Schedule:

1. The Contract shall be completed within the specified number of Days from the date a Notice to Proceed is issued as indicated in Table 1-1 of the executed Contract.
2. The Contractor shall be responsible for preparing and furnishing to the Architect/Engineer for approval (which must be approved before submission of the first monthly Application for Payment, a coordinated combined Construction Progress Schedule which incorporates the Construction Progress Schedules of the Contractor, all Subcontractors and all Suppliers engaged in completion of the Work. The Construction Progress Schedule shall be in the form of an arrow network diagram, bar chart, or other graphic Construction Progress Schedule in sufficient detail to satisfy the Architect/Engineer.
3. Monthly payment applications will not be processed by the Owner until and unless a single coordinated Construction Progress Schedule shall have been submitted by Contractor and approved by Architect/Engineer and Owner.
4. The Construction Progress Schedule based upon the Contractor's logic and time estimates shall indicate in suitable detail for display, all significant features of the Work of each Subcontractor and Suppliers, including the placing of materials orders and anticipated delivery dates for long lead items, submissions and approvals of Shop Drawings, all Work activities to be performed by each Subcontractor, and the beginning and time durations thereof and the dates of Substantial and Final Completion of the various branches of the Work.
5. Immediately upon receipt of Architect/Engineer's approval, the Contractor shall distribute Six (6) copies of the approved Construction Progress Schedule to the Architect/Engineer plus One (1) copy to

each Subcontractor. In the event a new Subcontractor, of any tier, is added to the job, the Contractor shall furnish a revised Construction Progress Schedule immediately with copies as indicated. The final coordinated Construction Progress Schedule shall be signed and dated by the Contractor and all Subcontractors.

6. Contractor (using Subcontractors as required) shall furnish sufficient labor, supervision, material and equipment to insure the prosecution of the Work in accordance with the approved Construction Progress Schedule. If the latest completion time for any significant portion of the Work doesn't come within the time allowed by the Construction Progress Schedule, the sequence of the jobs and/or the time for performance of the jobs shall be revised by the Contractor through concurrent operations, additional manpower, additional shifts, overtime, etc., until it is assured that the Contract Completion Date will be met. No additional costs to the Owner will be allowed by the Contractor for overtime, additional manpower, equipment, additional shifts, etc. (except as may be provided elsewhere in the Contract) if such expediting procedures or measures are necessary to meet the agreed Substantial and Final Completion dates.

7. Contractor agrees that it will make no claim for, and have no right to, additional payment or extension of time for completion of the Work, or any other concession because of any interpretation or misunderstanding on Contractor's or Subcontractors' part of the Construction Progress Schedule and the manner in which it will be used on the Project or because of any other Subcontractor's failure properly to participate in the development of a Construction Progress Schedule or to perform its Contract in accordance with the Construction Progress Schedule.

1.25 Protection of Work and Property:

1. Safety Precautions and Programs:

a. Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work.

b. Contractor shall designate a responsible member of its organization at the Site whose duty shall be the prevention of accidents. This person shall be the Contractor's Superintendent, unless otherwise designated by the Contractor in writing to the Architect/Engineer and Owner.

2. Safety of Persons and Property: Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

a. All employees and Subcontractors, of every tier, on the Work, occupants, tenants, invitees, visitors, guests and all other persons who may be affected thereby;

b. All the Work and all the materials and equipment to be incorporated therein, whether in storage on or off the Site, under the care, custody or control of the Contractor or any of its Subcontractors; and

c. Other property at the Site or adjacent thereto, including, but not limited to: trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.

3. The Contractor shall give all notices in writing, and comply with all applicable laws, ordinances, rules, regulations, and lawful orders of all authorities having jurisdiction bearing on the safety of persons or property of their protection for damage, injury or loss.

4. The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including rails, night-lights, the posting of danger signs, and other warnings against hazards, promulgating safety regulations, notifying Owners and

users of adjacent utilities and other means of protection against accidental injury or damage to persons or property.

5. When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution for the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

6. No Contractor shall load or permit any part of the Work to be loaded to create a safety hazard.

7. The Contractor shall promptly remedy all damage or loss to any property caused in whole or in part by the Contractor, any Subcontractors, of any tier, or anyone directly or indirectly employed by any of them, or by anyone whose acts any of them may be liable and for which the Contractor is responsible. The foregoing obligations of the Contractor are in addition to its other obligations as stated elsewhere in the Contract Documents.

1.26 Emergencies:

1. In any emergency affecting the safety of persons or property, the Contractor shall act with diligence, at its discretion, to prevent threatening injury, damage, or loss. In such case, Contractor shall immediately notify the Owner and Architect/Engineer of the action taken and shall prepare and submit a detailed and documented written report to the Owner and Architect/Engineer within 24 hours of the incident.

2. Wherever the Contractor has taken no action but has notified the Owner and the Architect/Engineer, or wherever the Owner and Architect/Engineer has otherwise been made aware of any emergency threatening injury to persons, or loss or damage to the Work, or to adjacent property, the Contractor shall act only as instructed or authorized by the Owner or Architect/Engineer.

1.27 Temporary Controls:

In addition to responsibilities under Division 01 Section 015000 – Temporary Facilities and Controls, Contractor shall be responsible for the following:

1. Dust Control: The Contractor, at its expense, shall provide and maintain necessary temporary dustproof partitions around areas of Work in any existing building or in new building areas as directed by the Architect/Engineer.

2. Haul Routes:

a. The Contractor shall be responsible for providing and maintaining unobstructed traffic lanes on the designated Construction Access Routes either shown on the Drawings or reasonably required to perform the Work and shall provide and maintain all reasonable required safety devices. Contractor shall provide the addition of material, with grading and compaction and the removal of snow, ice, and debris, to provide and maintain the general serviceable condition of the access roadbed, as well as pedestrian ways.

b. The Contractor shall obtain permission, in writing, from the Architect/Engineer before using any existing driveway or parking areas not specifically designated for such use in the Contract Documents for construction purposes. Contractor shall maintain such driveways and areas in good condition during the construction period, and upon completion of the Project, shall leave them in the same condition as the start of the Work. Conditions before use should be carefully photographed or documented by the Contractor.

1.28 Changes in the Work:

1. General:

- a. Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or a Field Order for a minor change in the Work, subject to the limitations stated in this §1.41 and elsewhere in the Contract Documents.
- b. A Change Order shall be based upon agreement among the Owner, Architect/Engineer and Contractor. A Construction Change Directive requires agreement by the Owner and Architect/Engineer and may or may not be agreed to by the Contractor. A Field Order for a minor change in the Work may be issued by the Architect/Engineer alone.
- c. Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or Field Order for a minor change in the Work.
- d. All Change Orders shall be paid at Orange County prevailing wage rates and any supplement applicable to the Project at the time such Work is performed. Rates must be approved by the Architect/Engineer and Owner in accordance with the Contract Documents.

2. Change Orders:

- a. Process.
 - i. First, a Proposed Change Order (PCO) must be submitted to the Architect/Engineer or issued by the Architect/Engineer and signed for approval by both the Contractor and Architect/Engineer.
 - ii. Second, a Change Order Request (COR) must be issued by the Architect/Engineer and signed for approval by the Architect/Engineer.
 - A. A COR shall only be issued if the corresponding PCO has been approved.
 - B. Approval of a COR does not imply or guarantee that a CO shall be approved.
 - iii. Third, a Change Order (CO) must be issued by the Architect/Engineer and signed for approval by the Architect/Engineer, Contractor, and Owner.
 - A. A CO shall only be issued if the corresponding COR has been approved.
 - B. The CO must also be processed through the Owner's contract approval system and executed by the County Executive.
 - C. An approved CO is required for i) Work to be paid for out of available Contingencies, ii) Work to be paid for by an increase or decrease in the Contract Sum.
 - iv. Forms for PCOs, CORs and COs shall be provided by the Architect/Engineer.
 - v. Final drafts of CORs and COs shall be prepared by the Architect/Engineer for the required approvals.

vi. Change Orders will not include any time for Contractor's supervision i.e.: Project Manager, Assistant Project Manager, Superintendent, Foreman, General Foreman or assistant Superintendent.

b. Proposed Changed Orders (PCOs).

i. The purpose of a PCO is to:

A. determine cause of the request; and

B. determine if it represents a potential change in the scope of Work as described in the Contract Documents.

ii. For a PCO to be approved, it must be signed by both the Contractor and Architect/Engineer.

iii. Architect/Engineer Initiated PCOs

A. The Architect/Engineer may initiate changes by submitting a PCO to Contractor. Request will include:

1. Detailed description of the change, products, and location of the change in the Project.

2. Supplementary or revised Drawings and Specifications.

3. The projected time span for making the change and a specific statement as to whether overtime Work is, or is not, authorized.

4. A specific period of time during which the requested price will be considered valid.

B. Such request is for information only and is not an instruction to execute the changes, nor to stop Work in progress.

C. If Contractor does not respond to a PCO request from the Architect/Engineer within the 48-Hour time frame, the Architect/Engineer may solicit quotes from others and back charge Contractor for all expenses associated with preparation of those quotes.

D. Any costs and delays attributed to lack of response by Contractor shall be back-charged to Contractor.

iv. Contractor Initiated PCOs

A. Contractor may initiate changes by submitting a PCO to the Architect/Engineer containing:

1. Description of the proposed changes.

2. Statement of the reason for making the changes.

3. Statement of the effect on the Contract Sum and the Contract Time.

4. A detailed estimate which shall include:
 - a. Labor with Pre-Approved Labor Rates;
 - b. itemized material requirements with supporting documentation from the supplier(s);
 - c. itemized equipment with supporting documentation from the rental company;
 - d. itemized breakdown from any subcontractors;
 - e. statement of the effect on the Work of separate Contractors, including an explanation of how this PCO impacts the most recent Construction Progress Schedule, if at all. If no indication of schedule impact is provided, the Architect/Engineer shall reasonably understand the PCO does not impact the Construction Progress Schedule or require a change to the Contract Time.
 - f. a specific period of time during which the requested price will be considered valid; and
 - g. documentation supporting any change in Contract Sum or Contract Time, as appropriate.

B. The Contractor must submit a PCO within Forty-Eight (48) hours of recognition of a potential change in scope for it to be valid. Failure to notify the Architect/Engineer within this time period shall provide basis for non-approval.

C. Failure of the Construction Manager to respond within the Forty-Eight (48-) hour period shall be deemed non-approval of the PCO, unless the Architect/Engineer has requested additional time for review.

D. All PCOs must be responded to within 48-hours of issuance unless noted otherwise; however, additional time for review may be requested within that 48-hour period.

E. No PCOs shall be approved where a related Notice of Non-Compliance is unresolved.

c. Change Order Requests (CORs).

i. Following approval of a PCO and issuance of a COR by the Architect/Engineer, the Architect/Engineer shall review the COR to determine (a) if it represents a compensable change to the Contractor's Scope of Work as described in the Contract Documents and, (b) if the cost is reasonable and accurate in its allocation.

ii. For a COR, the Contractor shall provide additional and sufficient substantiating data to allow the Architect/Engineer to evaluate the quotation.

iii. On request, provide additional data to support time and cost computations, including, but not limited to:

- A. support for each quotation for a Lump Sum proposal and for each Unit Price which has not previously been established;
- B. equipment required;
- C. products required;
- D. recommended source of purchase and unit cost;
- E. quantities required;
- F. taxes, insurance and bonds;(only if it exceeds total contract sum)
- G. credit for Work deleted from Contract, similarly documented
- H. overhead and profit; and
- I. justification for any change in Contract Time.

iv. Support each claim for additional costs and for Work done on a time-and-material/force account basis, with documentation as required for a Lump Sum proposal, plus additional information; including, but not limited to:

- A. name of the Owner's authorized agent who ordered the Work and date of the order;
- B. dates and times Work was performed and by whom;
- C. Time record, summary of hours worked and hourly rates paid

v. Provide receipts and invoices for:

- A. equipment used, listing dates and times of use;
- B. products used, listing quantities;
- C. subcontracts; and
- D. document requests for substitutions for products.

vi. Methods used in determining adjustments to the Contract Sum may include those listed in §1.41(3)(c).

d. Change Orders (COs).

i. Approved COs are required for any additional Work to be paid for out of a Contingency and any additional Work that shall equitably adjust the Contract Time and/or the Contract Sum by amounts as set forth in approved CORs.

- A. COs describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.
- B. COs provide an accounting of the adjustment in the Contract Sum and in the Contract Time.

ii. In order for a CO to be approved, both a PCO and a COR and must have been previously signed by the Contractor, Architect/Engineer and Owner for approval.

iii. Upon approval of a CO, the Contractor shall:

A. Proceed with the Work within Five (5) Days unless otherwise noted on the CO.

B. Revise Applications for Payment to record each change as a separate item of Work, and to record the adjusted Contract Sum.

C. Revise the Construction Progress Schedule to reflect each change in Contract Time.

D. Revise sub-schedules to show changes for other items of Work affected by the changes.

E. Enter pertinent changes in Project Record Documents.

e. Unit Price Based Change Orders.

When quantities of each of the items affected cannot be determined prior to start of the Work:

i. The Contractor shall establish a not-to-exceed budget amount and a PCO shall be approved for this amount.

ii. The Architect/Engineer shall issue a Construction Change Directive directing Contractor to proceed with the change on the basis of Unit Prices and will cite the applicable Unit Prices.

iii. At completion of the Work, Contractor will calculate the cost of such based on the Unit Prices and quantities used and provide such documentation to the Architect/Engineer.

iv. A corresponding COR shall be issued to indicate the final amounts.

f. Allowable Markups.

i. For Contingency based Work, costs of overhead and profit and related administration, bond, coordination, insurance and superintendence shall be included in the Lump Sum(s) indicated on this Bid Form. Markups and costs for such items shall not be allowed or included in calculating Change Orders funded out of the Contingency.

ii. Equipment in COR's: Equipment rental rates shall be billed at 80% of the Blue Book Rental Rate with no markup.

iii. Other mark-ups allowed for COR's, as follows:

A. Self-Performance of CO work by Contractor

1. Labor Markup: 5%

2. Material Markup: 5%

B. Performance of CO work by Subcontractors: Contractor's Markup on Subcontractor: 5% of first tier Subcontractor's labor and materials totals prior to any lower tier Subcontractor markups (Subcontractors labor and material totals may include lower tier Subcontractor labor and materials without any markup)

C. Wages in all Change Orders shall be at Orange County Prevailing Wage Rates and any supplement applicable to the Project at the time such Work is performed.

3. Construction Change Directives

a. A Construction Change Directive (CCD) is a written order to the Contractor, signed by Owner and Architect, which amends the Contract Documents as described and authorizes the Contractor to proceed with additional Work in the absence of a total agreement in terms of a PCO, COR and/or CO. The Owner, without invalidating the Contract, may, by a CCD issued through the Architect/Engineer, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly. The Contractor agrees that they are required to perform the Work of a CCD with reasonable and timely means and methods without the issuance of a COR and/or CO.

b. Procedure for CCD.

i. The CCD will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change and will designate the method of determining any change in the Contract Sum and any change in Contract Time.

ii. Owner and Architect/Engineer will sign and date the CCD as authorization for the Contractor to proceed with the changes.

iii. Contractor may sign and date the CCD to indicate agreement with the terms therein.

iv. The Architect/Engineer agrees to approve a PCO within Ten (10) Days of issuance of the CCD.

v. Resolution of a CCD into a CO shall follow the process outlined under 'Change Order Procedures' as described in these Supplemental Conditions.

vi. A CCD form shall be provided by the Architect/Engineer.

c. If the CCD provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

i. mutual acceptance of a Lump Sum properly itemized and supported by sufficient substantiating data to permit evaluation;

ii. Unit Prices stated in the Contract Documents or subsequently agreed upon; or

iii. as provided in §1.41(3)(f).

d. Upon receipt of a CCD, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect/Engineer of the Contractor's agreement or disagreement

with the method, if any, provided in the CCD for determining the proposed adjustment in the Contract Sum or Contract Time.

e. A CCD signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be processed as a Change Order.

f. If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Architect/Engineer on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable amount for overhead and profit. In such case, and also under §1.41(3)(c)(iii), the Contractor shall keep and present, in such form as the Architect/Engineer may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this §1.41(3)(f) shall be limited to the following all as related and necessary to the performance of the Work:

i. reasonable and customary costs of labor, including social security, disability, workers' compensation and unemployment insurance and fringe benefits required by agreement or custom;

ii. reasonable and customary costs of materials, supplies and equipment, whether incorporated or consumed, and including cost of transportation;

iii. reasonable and customary rental costs of machinery and equipment, exclusive of hand tools, whether rented by the Contractor or Subcontractors;

iv. reasonable and customary costs of premiums for all bonds and insurance, permit fees and sales, use or similar taxes related and applicable to the Work; and

v. reasonable and customary additional costs of supervision and field office personnel directly attributable to the change.

g. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect/Engineer. When both additions and credits covering related Work or substitutions are involved in a change, the mark-up for overhead and profit shall be figured on the basis of net increase in Contract Sum, if any, with respect to that change.

h. If the Owner and Contractor do not agree with the adjustment in Contract Time or the method for determining it, the adjustment or the method shall be referred to the Architect/Engineer for determination.

i. When the Owner and Contractor agree with the determination made by the Architect/Engineer concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

4. Field Orders

a. The Architect/Engineer will have authority, after consulting with the Owner, to memorialize trade-off agreements and/or order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be affected by a written Field Order on

forms provided by and issued through the Architect/Engineer and signed by the Architect/Engineer, Owner, and Contractor.

b. Field Orders shall be binding on the Owner and Contractor.

c. The Contractor shall carry out Field Orders promptly.

5. Omitted Work

a. If any Work in a Lump Sum Contract, or if any part of a Lump Sum item in a Unit Price, Lump Sum, or percentage-bid Contract is omitted by the Owner, the Contract Sum, subject to audit, shall be reduced by a pro rata portion of the Lump Sum Bid amount based upon the percent of Work omitted subject to §1.41(5)(d). For the purpose of determining the pro rata portion of the Lump Sum Bid amount, the Schedule of Values shall be considered, but shall not be the determining factor.

b. If the whole of a Lump Sum item or Units of any other item is omitted by the Owner in a Unit Price, Lump Sum, or percentage-bid Contract, then no payment will be made therefore except as provided in §1.41(5)(d).

c. For Units that have been ordered but are only partially completed, the Unit Price shall be reduced by a pro rata portion of the Unit Price Bid based upon the percentage of Work omitted subject to §1.41(5)(d).

d. In the event the Contractor, with respect to any omitted Work, has purchased after execution of this Agreement and in accordance with the Construction Progress Schedule if such purchase is specified therein, any non-cancelable material, equipment, or both that is not capable of use except in the performance of this Contract and has been specifically fabricated for the sole purpose of this Contract, but not yet incorporated into the Work, the Contractor shall be paid for the material or equipment. Such payment is contingent upon the Contractor's delivery of the material or equipment in acceptable condition to a location designated by the Owner.

e. The Contractor agrees to make no claim for damages or for loss of overhead and profit with regard to any omitted Work.

6. CHANGE ORDERS DUE TO INCREASED PREVAILING WAGE RATES SHALL NOT BE PERMITTED.

1.29 Application for Payment:

1. Work Included: Submit Applications for Payment to Architect/Engineer, in accordance with the Schedule of Values established by §1.29 of these General Conditions.

2. Format and Data Required: Submit applications typed on AIA documents (G702 and G703). Where "Architect" or "Engineer" is referred to on the AIA documents, it shall also mean "Architect/Engineer" as defined in this document.

3. Preparation of Application:

a. Application Form:

i. Fill in required information, including Change Orders executed prior to the date of submittal of Application;

- ii. Fill in summary dollar values to agree with respective totals indicated on continuation sheets;
- iii. Execute certification with signature of a responsible officer of Contractor's firm. Signature shall be notarized.

b. Continuation Sheets:

- i. Fill in total list of all scheduled component items of Work, with item number, and scheduled dollar value for each item;
- ii. Fill in dollar value in each column for each scheduled line item when Work has been performed or products stored. Round off values to nearest dollar or as specified in the Schedule of Values.
- iii. List each Change Order executed prior to date of submission at the end of the continuation sheets. Round off values to nearest dollar or as specified for Change Order executed prior to date of submission, at end of continuation sheets.
- iv. List by an original component item of Work.
- v. Submit revised Construction Progress Schedule with each Application for Payment.

4. Substantiating Data: When Architect/Engineer requires substantiating data, Contractor shall submit suitable information with a cover letter identifying the following:

- a. Project;
- b. Application number and date;
- c. Detailed list of enclosures;
- d. For stored products:
 - i. Item number and identification, as shown on application;
 - ii. Description of specific material.
- e. Submit one (1) copy of data and cover letter for each application.

5. Preparation of Final Application: Fill in Application form as specified for Progress Payments. All documentation, as called for in the Specifications (including, but not limited to, Sections on Photographic Documentation, Closeout Procedures, Operations and Maintenance Data, and Project Record Documents) shall have been submitted and found acceptable by the Owner before Application for Final Payment is made.

6. Submittal Procedure: Submit Five (5) copies of each Application for Payment to Architect/Engineer at times stipulated in the agreement. When Architect/Engineer finds the Application properly completed and correct, it will transmit Three (3) Certificates for Payment to Owner and return One (1) copy to Contractor. A certified payroll showing prevailing wage rates and supplemental benefits were paid must be included with each Application for Payment.

7. Back Charges: The Owner reserves the right to back charge a Contractor, through a deductive Change Order, for the cost of total and complete remedy due to the failure of Contractor to comply with any provision(s) of the Contract Documents.

8. Right to Cure:

a. If the Contractor refuses or fails to supply enough properly skilled workers; proper materials; maintain the Construction Progress Schedule, as amended by the Architect/Engineer from time to time; make Prompt Payment for its workers, Subcontractors or Suppliers; comply with laws, ordinances, rules, regulations or orders of any authority having jurisdiction; or otherwise fails to comply with any provision of the Contract Documents, and fails to commence and maintain satisfactory correction of such default with diligence and promptness, within Three (3) Working Days after receipt of written notice from the Architect/Engineer, then the Owner, without prejudice to any other rights or remedies, shall have the right to any or all of the following remedies:

i. Supply such number of workers and quantity of materials, equipment and other facilities as the Architect/Engineer deems necessary for the completion of the Contractor's Work, or any part thereof, which the Contractor has failed to complete or perform after the aforesaid notice, and charge the cost thereof to the Contractor, who shall be liable for the payment of same including reasonable markup as allowed by this Agreement.

ii. Contract with one or more additional Contractors or use its own forces to perform such part of the Contractor's Work as the Architect/Engineer shall determine will provide the most expeditious completion of the total Work and charge the costs thereof to the Contractor

iii. Withhold payment of any moneys due the Contractor, pending corrective action to the extent required by and to the satisfaction of the Architect/Engineer and the Owner.

iv. Charge the Contractor for all costs incurred by the Owner due to its failure to comply, delay or breach, including but not limited to, markup as allowed by the Contract Documents, litigation and attorney's fees and additional actual expenses incurred for supervision, equipment rental, and the like.

b. In the event of any emergency affecting the health or safety of persons or property, the Architect/Engineer may proceed as above without notice.

1.30 Contract Closeout:

1. Work Included: Provide an orderly and efficient transfer of the completed Work to the Owner. In addition to the responsibilities under Division 01 Section 017700 – Closeout Procedures, Contractor shall be responsible for the requirements under this §1.44.

2. Quality Assurance: Prior to requesting inspection by Architect/Engineer, use adequate means to assure that Work is completed, in accordance with specified requirements, and is ready for the requested inspection.

3. Procedures:

a. Substantial Completion:

i. Contract shall prepare and submit items required by applicable provisions of Division 01 Section 017700 – Closeout Procedures;

- ii. Contractor shall provide Consent of Surety to reduction in retainage;
 - iii. Within reasonable time after receipt of Punch List, Architect/Engineer will inspect to determine status of Substantial Completion;
 - iv. Should Architect/Engineer determine Work is not Substantially Complete:
 - A. Architect/Engineer promptly will so notify Contractor, in writing, giving the reasons;
 - B. Contractor shall remedy deficiencies and notify Architect/Engineer when ready for reinspection;
 - C. Architect/Engineer will reinspect Work.
 - v. When Architect/Engineer concurs that Work is Substantially Complete:
 - A. Architect/Engineer will prepare "Certificate of Substantial Completion" accompanied by Contractor's list of items to be completed or corrected, as verified by the Architect/Engineer;
 - B. Architect/Engineer will submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate.
- b. Final Completion:
- i. Contractor shall prepare and submit the items required by this §1.44(4)(b) and applicable provisions of Division 01 Section 017700 – Closeout Procedures;
 - ii. Contractor shall verify the Work is complete including, but not necessarily limited to, items mentioned in the General Conditions;
 - iii. Contractor shall certify the following:
 - A. Contract Documents have been reviewed;
 - B. Work has been inspected for compliance with Contract Documents;
 - C. Work has been completed, in accordance with Contract Documents;
 - D. Equipment and system have been tested as required, and are operational;
 - E. Work is completed and ready for final inspection;
 - F. Work meets requirements of and has been inspected by all authorities having jurisdiction;
 - G. Work has been installed, in accordance with the requirements of all manufacturers used on Project, and that no warranties or bonds have been voided.
 - iv. Architect/Engineer will make an inspection to verify status of completion;
 - v. Should Architect/Engineer determine that Work is incomplete or defective:

- A. Architect/Engineer shall promptly notify Contractor, in writing, listing incomplete or defective Work;
 - B. Contractor shall remedy deficiencies promptly and notify the Architect/Engineer when ready for reinspection.
 - vi. Once Architect/Engineer determines that Work is acceptable under the Contract documents, it will request Contractor to make Closeout Submittals.
- c. Closeout Submittals include, but are not necessarily limited to, the following:
 - i. Project Record Documents, including record Drawings, operation, and maintenance manuals.
 - ii. Operation and maintenance data for items so listed in pertinent other Sections of these Specifications and for other items when so directed by the Architect/Engineer.
 - iii. Guarantees, warranties and bonds (including Maintenance Bond).
 - iv. Keys and keying schedule.
 - v. Spare parts and extra stock of materials.
 - vi. Evidence of compliance with requirements of authorities having jurisdiction including, but not necessarily limited to the following:
 - A. Certificate of Inspection and acceptance from Fire Marshall;
 - B. Certificate of Inspection and acceptance from Electrical Department or UL;
 - C. Certificate of Occupancy.
 - vii. Certificate of Insurance for products and completed operations.
 - viii. Evidence of payment and release of liens from all Subcontractors and Suppliers.
 - ix. List of Subcontractors, service organizations, and principal vendors, including names, addresses and telephone numbers where they can be reached for emergency service at all times including nights, weekends, and holidays.
 - x. Consent of Surety to Final Payment (G707).
 - xi. Contractor's Affidavit of Release of Liens (G706A)
 - xii. Contractor's Affidavit of Payment of Debts and Claims (G706)
 - xiii. Certificate of Substantial Completion (G704).
 - xiv. Any other items identified in the Specifications as Closeout Submittals or as due prior to Substantial or Final Completion or Closeout.
- d. Final Adjustment of Accounts:

- i. Submit a final statement of accounting to Architect/Engineer, showing all adjustments to the Contract Sum;
- ii. If so required, Architect/Engineer will prepare a final Change Order showing adjustments to Contract Sum which were not made previously by Change Orders.

4. Instruction:

- a. Complete instruction of Owner's personnel in proper operation and maintenance of systems, equipment, and similar items which were provided as part of the Work;
- b. Minimum of Twenty-Four (24) hours instruction shall be provided to Owner's personnel at such time, as requested by Owner.

1.31 Cleaning:

In addition to Final Cleaning responsibilities detailed in Division 01 Section 017700 – Closeout Procedures and any cleaning requirements in other Sections of the Specifications, Contractor shall be responsible for the following:

1. Work Included:

- a. Provide necessary cleaning during construction to maintain Project Site and adjacent impacted areas free from accumulation of waste, debris, and rubbish caused by operations;
- b. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials; clean all sight-exposed surfaces, whether worked on or not; and leave Project clean and ready for occupancy;
- c. If Contractor fails to perform clean up during progress and Final Clean Up upon completion of Work, Owner may do so and charge the cost to the Contractor.

2. Requirements of Regulatory Agencies:

a. Fire Protection:

- i. Store volatile, flammable materials, and waste in covered protective metal containers and remove from premises daily; storage and handling of such materials shall meet requirements of the Fire Code and Fire Marshall;
- ii. Provide fire extinguishers, fire protective devices, firefighting clothing, equipment and materials in quantities and location, as required by the Fire Marshall;
- iii. Designate key person to be responsible for fire protection and firefighting.

b. Pollution Control:

- i. Conduct cleanup and disposal operations to comply with local ordinances and pollution laws:
 - A. Burning or burying of rubbish and waste materials on Project Site is prohibited;
 - B. Dispose of volatile fluid wastes; such as mineral spirits, oil or paint thinner; into storm and/or sanitary sewer systems, streams, and/or waterways is prohibited.

c. Whether or not specifically cited in the Contract Documents, Contractor shall comply with all other applicable federal, New York State and local laws, regulations, ordinances, permits and fees related to cleanup activities.

3. Quality Assurance:

a. Use adequate number of skilled technicians who are thoroughly trained and experienced in the necessary crafts and are completely familiar with the specified requirements and methods needed for proper performance of the Work in this §1.45;

b. Use experienced laborers or professional cleaners for the Final Cleaning.

4. Cleaning Materials:

a. Use only cleaning materials recommended by manufacturer of surface to be cleaned;

b. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

5. During Construction:

a. Contractor shall oversee cleaning of its Work operations and shall ensure that building and grounds at the Site are maintained free from accumulations of waste materials and rubbish;

b. Contractor shall sprinkle dusty debris with water before removal;

c. At One (1) week intervals, maximum, during progress of the Work, Contractor shall cleanup Site and dispose of waste materials, rubbish, and debris;

d. Contractor to provide dump containers and locate on Site for collection of waste materials, rubbish, and debris and provide removal service at Contractor's expense;

e. Contractor shall not allow its waste materials, rubbish, and debris to accumulate and become unsightly or hazardous condition;

f. Contractor shall vacuum or otherwise clean interior of Project areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until Project is ready for acceptance or occupancy;

g. Contractor shall lower waste materials in a controlled manner, with as few handlings as possible, and not drop or throw materials from heights;

h. Contractor shall schedule cleaning operations so dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces, or on equipment.

6. Final Cleaning: Prior to Substantial Completion and turnover of the Project to the Owner, Contractor shall clean all areas of the Project and Site, whether worked on or not, if affected by Contractor's operations in accordance with this §1.45 and Final Cleaning requirements under Division 01 Section 017700 – Closeout Procedures

1.32 Project Record Documents:

In addition to the responsibilities under Division 01 Section 017839 – Project Record Documents, Contractor shall have the following responsibilities:

1. Work Included:

a. Contractor shall provide maintenance of Project Record Documents, as follows:

i. Maintain at job Site One (1) copy of the following:

- A. Contract Drawings;
- B. Specifications;
- C. Addenda;
- D. Approved Shop Drawings;
- E. Approved catalog cuts;
- F. Change Orders;
- G. Other modifications to the Contract;
- H. Field test reports;
- I. Working set of Project Record Drawings.

ii. Store Project Record Documents in temporary field office, apart from other documents used for construction;

iii. Provide necessary files and racks for storage of Project Record Documents;

iv. Do not use Project Record Documents for construction purposes;

v. Make Project Record Documents available at all times for inspection by Architect / Engineer and Owner.

2. Recording: Information shall be recorded by the Contractor to permit accurate record Drawings to be made by Architect/Engineer:

a. Label each document file, "PROJECT RECORD", in two inch (2") high printed letters;

b. Keep Project Record Documents current;

c. Do not allow any Work to be permanently sealed until required information has been recorded;

3. Subcontractors and Suppliers List: Provide a complete list of names, addresses, and telephone numbers of all Contractors, Subcontractors, and Suppliers employed on the Project.

4. Submittals:

a. At completion of Project, deliver Project Record Documents to Architect/Engineer;

b. Provide Two (2) copies of each Project Record Document with a Submittal letter also in duplicate, containing the following:

i. Date;

- ii. Project title and number;
- iii. Contractor's name and address;
- iv. Title and number of each Project Record Document;
- v. Certification in writing that each Project Record Document, as submitted, is complete and accurate and reflects the actual condition at the building Site;
- vi. Signature of Contractor or authorized representative.

1.33 Operation & Maintenance Data:

1. Contractor, as well as Subcontractors and Suppliers, shall provide maintenance information and operation instructions for equipment and systems provided as per Division 01 Section 017823 – Operation and Maintenance Data.
2. Contractor shall coordinate efforts of its Subcontractors and Suppliers with respect to provision of Operation and Maintenance Data and shall integrate their efforts with Contractor's.

1.34 Contractor Assumption of Liability:

1. Any approval given by the Owner or Architect/Engineer shall not release the Contractor from its full responsibility for the accurate and complete performance of the Work in accordance with the Contract or from any duty, obligation, or liability imposed upon it by the Contract or from responsibility for injuries to persons or damage to property.
2. Any approval given by the Owner or Architect/Engineer pursuant to any provision of the Contract shall be construed merely to mean that at the time the approval is given, the Owner or Architect/Engineer had no reason for objecting. Such approval does not release the Contractor from its full responsibility for the accurate and complete performance of the Work and any guarantees or warranties in accordance with the Contract or any duty, obligation, or liability imposed upon it by the Contract or from responsibility for injuries to persons or damage to property.

1.35 Lien Interest in Materials and Supplies:

No materials or supplies, for the Work shall be purchased by the Contractor or by Subcontractors or Suppliers, subject to any lien interest (other than pursuant to New York State Lien Law §5) or under a conditional sale or other agreement by which an interest is retained by the seller. The Contractor warrants that it has good title to all materials and supplies used in the Work. Supporting documentation in Payment Applications from Subcontractors or Suppliers containing language purporting such interests shall be rejected for revision and resubmission.

END OF SECTION 010000

TABLE 1-1

COMPLETION DATES & LIQUIDATED DAMAGES

Description	Contract Start Date	Construction Start Date	Substantial Completion Date	Construction Completion Date	Liquidated Damages \$/Calendar Day
Interior Renovations/ Village of Woodbury Building Department Highland Mills, NY	TDB	Shall be date as written in Notice to Proceed (NTP)	+90 Calendar Days after Construction Start Date	+14 Calendar Days after Substantial Completion	\$1,000.00

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification ("Site"): **Interior Renovations
Village of Woodbury Building Department
Highland Mills, NY**
- B. Owner: **Village of Woodbury Building Department
19 Adams Street
Highland Mills, NY 10930**
 - 1. Owner's Representative: Ms. Desiree Potvin, Village Clerk
- C. Architect/Engineer: LAN Associates, Engineering, Planning, Architecture, Surveying,
LLP ("LAN")
252 Main St.
Goshen, NY 10924
- D. The Work consists of the following:
 - 1. Interior Renovation of an existing garage bay into one half office space (740 SF) and one half storage (730 SF). The new office space will incorporate a new public toilet into the floor plan (55 SF) and a new vestibule (175 SF). Epoxy flooring will be the finish in the proposed public toilet and the new vestibule and the proposed storage with a 4" cove base. All exterior wall shall be furred out and insulated per the drawings.
 - 2. Interior Renovation of the existing office side of the building will primarily be limited to new floor, wall, and ceiling finishes. The existing shower room will be converted into a staff toilet by demolishing the existing shower and installing new plumbing fixtures and bathroom accessories. The existing kitchen counter will be renovated.
 - 3. Exterior Renovations will consist of installing a new storefront system in one of the existing overhead door locations at the proposed vestibule, as well as blocking up two (2) additional overhead door openings and finishing the exterior surface with stucco to match the existing building finish. The north façade scope entails removing existing paint and

parging and installing new stucco finish over the existing wall. Repointing of concrete block is also part of the scope of work for this façade.

E. Project will be constructed under a single prime contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings
 - 2. Project meetings
- B. See Section 017000 Execution Requirements for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 COORDINATION

- A. Coordination: Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Contractor shall coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation, including, without limitation:
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with Subcontractors, Suppliers and any other contractors of Owner to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Contractor shall prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of Subcontractors and Owner's other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Construction Progress Schedule per §1.34 of the General Conditions

2. Preparation of the Schedule of Values
3. Installation and removal of temporary facilities and controls
4. Delivery and processing of submittals
5. Progress meetings
6. Preinstallation conferences
7. Project closeout activities
8. Startup and adjustment of systems
9. Project closeout activities

1.3 PROJECT MEETINGS

A. Work Included:

1. To enable orderly review during progress of the Work and to provide for systematic discussion of problems, Architect/Engineer will conduct Project Meetings throughout the construction period; Architect/Engineer will schedule and administer pre-construction meeting, periodic progress meetings, and specially called meetings throughout the progress of Work including:
 - a. Provide an agenda for meetings
 - b. Give notice of each meeting at least Four (4) Days in advance of meeting date (except for meetings to discuss Work critical to completion of Project)
 - c. Make physical arrangements for meetings
 - d. Preside at meetings
 - e. Record minutes including significant proceedings and decisions
 - f. Reproduce and distributes copies of minutes after each meeting for the following:
 1. Owner
 2. Contractor
 3. Participants at meeting (other than those employed by the Contractor)
 4. Recipients shall copy and distribute more as deemed appropriate
2. Representatives of Contractors, Subcontractors, and Suppliers attending meetings shall be qualified and shall have authority to act on behalf of the entity each represents.

B. Pre-Construction Meeting:

1. A pre-construction meeting will be scheduled within Fifteen (15) Days after date of Notice to Proceed, and before the commencement of operations.
2. Location will be on Site in area provided by the Contractor.
3. Attendance by the following is required:
 - a. Owner's representative
 - b. Architect/Engineer and its professional consultants

- c. Resident project representative (if applicable)
 - d. Contractor's superintendent
 - e. Major Subcontractors
 - f. Major Suppliers
 - i. Others, as appropriate
4. Agenda will address the following areas as appropriate:
- a. Use of premises such as office, Work and storage areas and Owner's requirements
 - b. Construction facilities, controls, construction aids
 - c. Temporary utilities
 - d. Toilet facilities
 - e. Safety procedures
 - f. First aid procedures
 - g. Security procedures
 - h. Housekeeping procedures
 - i. Emergency contacts with telephone numbers
 - j. Review of proposed Subcontractors
 - k. Designation of key personnel
 - l. Communications
 - m. Schedule of Values and Application for Payment
 - n. Construction Progress Schedule
 - o. Submittals
 - p. Project Record Documents
 - q. Processing Field and Change Orders

C. Progress Meetings:

- 1. Regular periodic meetings will be scheduled on a weekly basis, or as required
- 2. Additional meetings will be held, if required by progress of the Work
- 3. Location of meetings at project field office on Site
- 4. Attendance:
 - a. Owner's representative
 - b. Architect/Engineer, and its professional consultants, as needed
 - c. Subcontractors, as appropriate to the agenda
 - d. Suppliers, as appropriate to the agenda
 - e. Others, as needed

D. Suggested Agenda:

- 1. Review of Work in progress on date of meeting
- 2. Review and approval of minutes of previous meeting
- 3. Review of Work progress since previous meeting
- 4. Field observations, problems, conflicts
- 5. Problems which impede Construction Progress Schedule

6. Review of off-Site fabrication and delivery schedules
7. Corrective measures and procedures to reestablish projected schedule
8. Revisions to Construction Progress Schedule
9. Progress and schedule for succeeding Work period
10. Coordination of schedules
11. Review submittal of schedules and expedite as required
12. Maintenance of quality standards
13. Pending changes and substitutions
14. Review of proposed changes for the following:
 - a. Effect on Construction Progress Schedule and Substantial and Final Completion dates
 - b. Effect on other contracts of Project
15. Other business:
 - a. Safety problems
 - b. Coordination of Site use with Owner
16. Items to be added to agenda for next meeting.

E. Revisions to Minutes:

1. Unless published minutes are challenged, in writing, prior to the next regularly scheduled progress meeting, they will be accepted as properly stating activities and decisions of the meeting;
2. Persons challenging published minutes shall reproduce and redistribute copies of the challenge to all indicated recipients of the minutes;
3. Challenge to minutes shall be settled as the priority portion of the "old business" at the next regularly scheduled meeting.

- F. Observations: Contractor, to the extent possible, shall have materials and Work available for inspection by Architect/Engineer at the time of the meeting.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013233 – PHOTOGRAPHIC DOCUMENTATION

PART 1 - PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including the General Conditions and the other Division 01 Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Periodic construction photographs.
- B. Related Sections include the following:
 - 1. Section 017700 Closeout Procedures for submitting digital media as Project Record Documents at Project closeout.

1.03 SUBMITTALS

- A. Key Plan: Contractor shall submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same label information as corresponding set of photographs.
- B. Construction Photographs: Submit Two (2) prints of each photographic view within Seven (7) Days of taking photographs.
 - 1. Format: 4-by-6-inch smooth-surface matte prints on single-weight commercial-grade photographic paper, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.
 - 2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:
 - a. Date photograph was taken if not date stamped by camera.
 - b. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - c. Unique sequential identifier.
 - 3. Digital Images: Submit a complete set of digital image electronic files with each Submittal of prints as a Project Record Document on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

1.04 COORDINATION

- A. Auxiliary Services: Contractor shall cooperate with photographer and provide auxiliary services requested, including access to Project Site and use of Temporary Facilities, including temporary lighting required to produce clear, well-lit photographs without obscuring shadows.

1.05 USAGE RIGHTS

- A. Contractor shall obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

- A. Digital Images: Contractor shall provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

PART 3 - EXECUTION

3.01 CONSTRUCTION PHOTOGRAPHS

- A. General: Contractor shall provide photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in filename for each image.
 - 2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project Site, available at all times for reference. Identify images same as for those submitted to Architect/Engineer.
- C. Preconstruction Photographs: Before commencement of demolition, take color, digital photographs of Project Site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect/Engineer.
 - 1. Take Eight (8) photographs to show existing conditions adjacent to property before starting the Work.
 - 2. Take Twenty (20) photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.

3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Periodic Construction Photographs: Take Twelve (12) color, digital photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- E. Architect/Engineer-Directed Construction Photographs: From time to time, Architect/Engineer will instruct photographer about number and frequency of color, digital photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.
1. Final Completion Construction Photographs: Take Eight (8) color photographs after date of Substantial Completion for submission as Project Record Documents. Architect/Engineer will direct photographer for desired vantage points.

END OF SECTION 013233

SECTION 013300 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. General Conditions for submitting Applications for Payment and the Schedule of Values.
 - 2. General Conditions for submitting warranties.
 - 3. General Conditions for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
 - 5. Division 1 Section "Photographic Documentation" for submitting construction photographs.
 - 6. Division 1 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 7. Divisions 2 through 16 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Divisions 2 - 16 for a list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 30 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 30 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 45 days for initial review of each submittal.
 5. Material Testing: Allow 90 days for review of each submittal.
- E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Contractor.
 - d. Name and address of subcontractor.
 - e. Name and address of supplier.
 - f. Name of manufacturer.
 - g. Submittal number or other unique identifier, including revision identifier.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
 - j. Location(s) where product is to be installed, as appropriate.
 - k. Other necessary identification.

- F. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - 1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
 - 2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
 - 1. Transmittal Form: Use AIA Document G810.
 - 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked "No Exceptions Taken."
- J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- K. Use for Construction: Use only final submittals with mark indicating "No Exceptions Taken" by Architect.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
 - 1. Signed copy of CADD Release Form.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Printed performance curves.
 - g. Operational range diagrams.
 - h. Mill reports.
 - i. Standard product operation and maintenance manuals.
 - j. Compliance with specified referenced standards.
 - k. Testing by recognized testing agency.
 - l. Notation of coordination requirements.
 - 4. Submit Product Data before or concurrent with Samples.
 - 5. Number of Copies: Submit six copies of Product Data, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Schedules.
 - g. Compliance with specified standards.
 - h. Notation of coordination requirements.
 - i. Notation of dimensions established by field measurement.
 - j. Relationship to adjoining construction clearly indicated.
 - k. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
 3. Number of Copies: Submit six opaque copies of each submittal, unless copies are required for operation and maintenance manuals. Submit eight copies where copies are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit three full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
- E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
 2. Number and name of room or space.
 3. Location within room or space.
 4. Number of Copies: Submit four copies of product schedule or list, unless otherwise indicated. Architect will return two copies.
 - a. Mark up and retain one returned copy as a Project Record Document.

- F. Submittals Schedule: Comply with requirements specified in the General Conditions.
- G. Application for Payment: Comply with requirements specified in the General Conditions.
- H. Schedule of Values: Comply with requirements specified in the General Conditions.
- I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
 - 4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Architect will return one copy.
 - a. Retain returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 - 1. Number of Copies: Submit four (4) copies of each submittal, unless otherwise indicated. Architect will not return copies.
 - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in the General Conditions.
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- M. Schedule of Tests and Inspections: Comply with requirements specified in the General Conditions.
- N. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."
- P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a

product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

R. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

S. Construction Photographs: Comply with requirements specified in Division 1 Section "Photographic Documentation."

T. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S/ ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - 1. "NO EXCEPTIONS TAKEN": Submission is in full compliance with all contract documents, or indicated deviations are acceptable.
 - 2. "MAKE CORRECTIONS NOTED": Submission has minor corrections not significant enough to require resubmission; noted corrections must be made in the final installation.
 - 3. "REJECTED": Submission does not meet contract requirements; resubmission of shop drawings, which meet contract requirements, is required.
 - 4. "AMEND AND RESUBMIT": Resubmission is required due to the nature and/or number of corrections.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 – QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Contractor is responsible for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect/Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Section 007000 - General Conditions §1.23 Openings, Channels, Cutting and Patching for repair and restoration of construction disturbed by testing and inspecting activities.
 - 2. Technical Sections for specific test and inspection requirements.

1.03 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include Contract enforcement activities performed by Architect/Engineer.
- C. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, (both defined in §1.06(G) of this Section) or a testing agency qualified to conduct product

testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

- E. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- F. Field Quality-Control Testing: Tests and inspections that are performed on-Site for installation of the Work and for completed Work.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee or Subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- I. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of Five (5) previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.04 CONFLICTING REQUIREMENTS

- A. General: If compliance with Two (2) or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, Contractor shall comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect/Engineer in writing for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect/Engineer for a decision in writing before proceeding.

1.05 SUBMITTALS

- A. Qualification Data: For testing agencies specified in §1.06 Quality Assurance of this Section to demonstrate their capabilities and experience. Contractor shall include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Contractor shall prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.

3. Identification of applicable standards.
 4. Identification of test and inspection methods.
 5. Number of tests and inspections required.
 6. Time schedule or time span for tests and inspections.
 7. Entity responsible for performing tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.06 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling Work similar in material, design, and extent to that indicated for this Project, whose Work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

- c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build Site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect/Engineer, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

1.07 QUALITY CONTROL

- A. Unless otherwise indicated, Contractor shall provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
- 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 2. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 010000 General Conditions §1.28.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect/Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect/Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- E. Associated Services: Contractor shall cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project Site.
- F. Coordination: Contractor shall coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- G. Schedule of Tests and Inspections: Contractor shall prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within Sixty (60) Days of date established for the Notice to Proceed.
1. Distribution: Distribute schedule to Owner, Architect/Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.08 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect/Engineer.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project Site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect/Engineer's reference during normal working hours.

1.09 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with the Contract Document requirements for Section 010000 General Conditions §1.32 Openings, Channels, Cutting and Patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 014000

SECTION 015000 – TEMPORARY FACILITIES AND CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
 - 1. Section 010000 General Conditions for limitations on utility interruptions and other Work restrictions.
 - 2. Section 010000 General Conditions for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Section 011000 Summary of Work for division of responsibilities for temporary facilities and controls.
 - 4. Divisions 2 through 16 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 USE CHARGES

- A. General: Cost or use charges for Temporary Facilities shall be included in the Contract Sum. Contractor shall allow other entities to use Temporary Services and Facilities without cost, including, but not limited to, Owner's construction forces or other contractors, Architect/Engineer, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Electric Power Service: Contractor shall pay electric power service use charges for electricity used by all entities for construction operations.

1.4 SUBMITTALS

- A. Site Plan: Show Temporary Facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Contractor shall arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Field Offices, General: Contractor shall provide prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Contractor shall provide a field office(s) of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project Site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of Twelve (12) individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack board.
 - 3. Drinking water and private toilet for use by Contractor, Subcontractors, Suppliers and all other visitors to office.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 degrees F.
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Contractor shall provide, on-Site, sheds, trailers or storage units sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building
- D. Unless otherwise stated in the Contract Documents, Contractor shall provide the necessary enclosed sanitary conveniences for the use of all workers of Contractor, Subcontractors and Suppliers, and inspection personnel. They shall be of a type approved by the Owner and the New York State Department of Labor and shall be maintained by Contractor and kept in a clean and satisfactory manner. Facilities such as "Sani-John" or similar prefabricated units will be approved as long as they are kept in a clean condition. Each unit shall include a toilet and a urinal. These structures shall be sufficient in number for the size of the job, and their use will be required. Contractor shall notify all that no nuisances will be permitted in this regard, and any complaints shall call for stricter enforcement of these provisions.

2.2 EQUIPMENT

- A. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, Contractor shall provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 11 at each return air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Contractor shall locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit Site disturbance as specified in Section 011000 Summary of Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Contractor shall install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sanitary Facilities: Contractor shall provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Toilets: Use of Owner's existing toilet facilities will not be permitted.
- C. Heating and Cooling: Contractor shall provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- D. Electric Power Service: Contractor shall provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service underground, unless otherwise indicated.

2. Connect temporary service to Owner's existing power source, as directed by Owner with previous written approval.
- E. Lighting: Contractor shall provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- F. Telephone Service: Contractor shall provide temporary telephone service in common-use facilities for use by all construction personnel. Install one (1) telephone line(s) for each field office.
1. Contractor shall provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.
 2. Contractor shall at each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Architect/Engineer's office.
 - e. Owner's office.
 - f. Subcontractors' field and home offices.
 3. Contractor shall provide its superintendent/foreman with cellular telephone or portable two-way radio for use when away from field office.

3.3 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Contractor shall enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Contractor shall maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Contractor shall not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Contractor shall remove each Temporary Facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Contractor shall complete or, if necessary, restore permanent construction that may have been delayed because of interference with Temporary Facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute Temporary Facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with Final Cleaning requirements specified in Section 017700 Closeout Procedures.

END OF SECTION 015000

SECTION 015610 – TEMPORARY FENCING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes: Erection, maintenance, and dismantling of Temporary Fencing around construction Site and materials storage areas. This Section does not apply where security fencing is required.
- B. Refer to Drawings for temporary fence type, layout, and location of gates.

1.2 SUBMITTALS

- A. Contractor shall submit in accordance with Section 01330 Submittal Procedures:
 - 1. Shop Drawing indicating layout of Temporary Fencing, location and size of gates, existing pavement and roads, access to fire hydrants and hose connections, and other Site- specific conditions. Prepare drawing after Site observation and verification of existing conditions.

PART 2 - PRODUCTS

2.1 TEMPORARY CHAIN LINK FENCING

- A. Unless otherwise indicated, type of temporary six feet (6') high chain link fencing shall be Contractor's option. Following types are acceptable:
 - 1. New materials or previously used salvaged chain link fencing in good condition.
 - 2. Posts: Galvanized steel pipe of diameter to provide rigidity. Post shall be suitable for setting in concrete footings, driving into ground, anchoring with base plates, or inserting in pre-cast concrete blocks.
 - 3. Fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.
- B. Gates: Contractor shall provide personnel and vehicle gates of the quantity and size indicated on the Drawings or required for functional access to Site.
 - 1. Fabricate of same material as used for Temporary Fencing.
 - 2. Vehicle gates:
 - a. Minimum width: 20 feet to allow access for emergency vehicles.
 - b. Capable of manual operation by one person.

PART 3 - EXECUTION

3.1 LAYOUT

- A. Contractor's installation of Temporary Fencing shall not deter or hinder access to existing and new hose connections and fire hydrants.
 - 1. Maintain 3 feet diameter clear space around fire hydrants.
 - 2. Where fire hydrant or hose connection is blocked by fencing, provide access gate.
- B. Access: Contractor shall provide gates for personnel, delivery of materials, and access by emergency vehicles.
- C. Field verify location with Owner.

3.2 INSTALLATION

- A. Chain link posts:
 - 1. Space as 10 feet maximum.
 - 2. Drive posts, set in holes and backfill, anchor in present concrete blocks, or anchored to base plates.
 - 3. For soft and unstable ground condition cast concrete plug around post.
 - 4. Posts over pavement: Use steel post plates or pre-cast concrete blocks.
 - 5. Gate posts: Use bracing or concrete footings to provide rigidity for accommodating size of gate.
- B. Fabric: Securely attach to posts.
- C. Gates: Install with required hardware.

3.3 MAINTENANCE AND REMOVAL

- A. Contractor shall maintain Temporary Fencing in good condition. If damaged, immediately repair.
- B. Contractor shall remove Temporary Fencing upon completion of Work or when no longer required for security or control. Backfill holes and compact. Holes in pavement shall be surfaced to match existing paving. Repair damage caused by installation of Temporary Fencing.

END OF SECTION 015610

SECTION 017300 – EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout
 - 2. Field engineering and surveying
 - 3. General installation of products
 - 4. Coordination of Owner-installed products
 - 5. Progress cleaning
 - 6. Starting and adjusting
 - 7. Protection of installed construction
 - 8. Correction of the Work
- B. Related Sections include the following:
 - 1. Section 013100 Project Management and Coordination for procedures for coordinating field engineering with other construction activities.
 - 2. Section 010000 General Conditions §1.28 for submitting surveys.
 - 3. Section 010000 General Conditions §1.32 for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
 - 4. Section 017700 Closeout Procedures for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and Final Cleaning.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Existing Conditions: The existence and location of Site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning Work, Contractor shall investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, Contractor shall investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for Work related to Project that must be performed by public utilities serving Project Site.
- C. Acceptance of Conditions: Contractor shall examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work
 - b. List of detrimental conditions, including substrates
 - c. List of unacceptable installation tolerances
 - d. Recommended corrections
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Existing Utility Information: Contractor shall furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Contractor shall take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by

field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. Space Requirements: Contractor shall verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, Contractor shall submit a request for information to Architect/Engineer. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.03 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, Contractor shall verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect/Engineer promptly.
- B. Building Lines and Levels: Contractor shall locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical Work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- C. Record Log: Contractor shall maintain a log of layout control Work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect/Engineer.

3.04 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Contractor shall locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect/Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect/Engineer before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Contractor shall establish and maintain a minimum of Two (2) permanent benchmarks on Project Site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.05 INSTALLATION

- A. General: Contractor shall locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical Work plumb and make horizontal Work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.
- B. Contractor shall comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Contractor shall install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Contractor shall conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Contractor shall not use tools or equipment that produce harmful noise levels.
- F. Templates: Contractor shall obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Contractor shall provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect/Engineer.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project Site in time for installation.
- H. Joints: Contractor shall make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

- I. Hazardous Materials: Contractor shall use products, cleaners, and installation materials that are not considered hazardous.

3.06 PROGRESS CLEANING

- A. General: Contractor shall clean Project Site and Work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than Seven (7) Days during normal weather or Three (3) Days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Contractor shall maintain Project Site free of waste materials and debris.
- C. Work Areas: Contractor shall clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire Work area, as appropriate.
- D. Installed Work: Contractor shall keep installed Work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Contractor shall remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Contractor shall clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-Site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, Contractor shall clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Contractor shall clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

- J. Limiting Exposures: Contractor shall supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.07 STARTING AND ADJUSTING

- A. Contractor shall start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Contractor shall adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Contractor shall test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, Contractor shall comply with qualification requirements in Section 014000 Quality Requirements.

3.08 PROTECTION OF INSTALLED CONSTRUCTION

- A. Contractor shall provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Contractor shall comply with manufacturer's written instructions for temperature and relative humidity.

3.09 CORRECTION OF THE WORK

- A. Contractor shall repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 010000 General Conditions §1.32
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Contractor shall restore permanent facilities used during construction to their specified condition.
- C. Contractor shall remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Contractor shall repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Contractor shall remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017320 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected Site elements.
 - 3. Salvage of existing items to be reused or recycled.
- B. Related Sections include the following:
 - 1. Section 010000 General Conditions §1.18 for requirements on use of premises and Owner-occupancy requirements.
 - 2. Section 013233 Photographic Documentation for preconstruction photographs taken before selective demolition operations.
 - 3. Section 015000 Temporary Facilities and Controls for temporary construction and environmental-protection measures for selective demolition operations.
 - 4. Section 010000 General Conditions §§1.4.3, 1.16, and 1.45, for disposal of demolished materials.
 - 5. Section 010000 General Conditions §1.32 for cutting and patching procedures.
 - 6. Section 024100 Building Demolition for demolition of entire buildings, structures, and Site improvements.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-Site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, appliances, antiques, and other items of interest or value to Owner that may be encountered during selective demolition shall remain Owner's property. Contractor shall carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
 - 1. Contractor shall coordinate with Architect/Engineer and Owner's consultant's, if any, who will establish special procedures for removal and salvage.

1.5 SUBMITTALS

- A. Schedule of Selective Demolition Activities: Contractor shall indicate the following:
 - 1. Detailed sequence of selective demolition and removal Work, with starting and ending dates for each activity.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Locations of proposed dust- and noise-control temporary partitions and means of egress.
 - 6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
 - 7. Means of protection for items to remain and items in path of waste removal from building.
- B. Inventory: After selective demolition is complete, Contractor shall submit a list of items that have been removed and salvaged.
- C. Predemolition Photographs: Contractor shall show existing conditions of adjoining construction and Site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Section 013233 Photographic Documentation. Submit before Work begins.
 - 1. Disposal Records: Contractor shall provide:
 - a. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
 - b. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
 - c. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
 - d. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste, including but not limited to hazardous waste, by landfills and

incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

- e. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition Work similar in material and extent to that indicated for this Project.
- B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with current versions of ANSI A10.6 and NFPA 241.
- E. Predemolition Conference: Conduct conference at Project Site to comply with requirements in Section 013100 Project Management and Coordination.
- F. Predemolition Conference: Conduct conference at Project Site to comply with requirements in Section 013100 Project Management and Coordination. Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of Work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.7 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
 - 1. Comply with requirements specified in Section 011000 Summary of Work.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before selective demolition, Owner will remove the following items, if present:

- a. Furniture
 - b. Office Equipment
 - c. Safe
 - d. Food Service Equipment
 - e. ATM (Automatic Teller Machine)
- C. Contractor shall notify Architect/Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Contractor shall examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- E. Contractor's storage or sale of removed items or materials on-Site is not permitted.
- F. Utility Service: Contractor shall maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

- A. Existing Warranties: Contractor shall remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall verify that utilities have been disconnected and capped.
- B. Contractor shall survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Contractor shall inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, Contractor shall investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect/Engineer.
- E. Contractor shall engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Survey of Existing Conditions: Contractor shall record existing conditions by use of preconstruction photographs.
 - 1. Comply with requirements specified in Section 013233 Photographic Documentation.
 - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- G. Contractor shall perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Contractor shall maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - 1. Comply with requirements for existing services/systems interruptions specified in Section 011000 Summary of Work.
- B. Service/System Requirements: Contractor shall locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Contractor shall conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Section 015000 Temporary Facilities and Controls.
- B. Temporary Facilities: Contractor shall provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish Work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 Temporary Facilities and Controls.
- C. Temporary Shoring: Contractor shall provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Contractor shall demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until Work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-Site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly.
- B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect/Engineer's approval.
1. Building Structure and Shell: N/A
 2. Nonshell Elements: 50 percent.
- C. For Removed and Salvaged Items, Contractor shall:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
- D. For Removed and Reinstalled Items, Contractor shall:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. For Existing Items to Remain: Contractor shall protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect/Engineer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
 - 1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
- F. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, Contractor shall remove demolished materials from Project Site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-Site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 010000 General Conditions §§1.4.3, 1.16, and 1.45, for disposal of demolished materials.
- B. Burning: Contractor shall not burn demolished materials.
- C. Disposal on Owner's property: At Owner's sole discretion and instruction, Contractor shall transport demolished materials and legally dispose of at designated spoil areas on Owner's property.
- D. Off-Site Disposal: Contractor shall transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Contractor shall clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.8 SELECTIVE DEMOLITION SCHEDULE

- A. Refer to Drawings

END OF SECTION 017320

SECTION 017700 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Sections, apply to this Section.
- B. Refer to Section 010000 General Conditions §§1.44 and 1.45 for additional requirements.
- C. Refer to Section 013233 Photographic Documentation.
- D. Refer to Section 017823 Operation and Maintenance Data.
- E. Refer to Section 017839 Project Record Documents.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for Contract Closeout, including, but not limited to, the following:
 - 1. Inspection procedures
 - 2. Warranties
 - 3. Final cleaning
- B. Related Sections include the following:
 - 1. Section 013233 Photographic Documentation for submitting Final Completion construction photographs and negatives.
 - 2. Divisions 02 through 26 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.03 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, Contractor shall complete the following. Provide a Punch List of items below that are incomplete in request as per §1.05 of this Section.
 - 1. Prepare a Punch List of items to be completed and corrected, the value of items on the Punch List, and reasons why the Work is not complete.
 - 2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

4. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 5. Terminate and remove temporary facilities from Project Site, along with mockups, construction tools, and similar elements.
 6. Complete final cleaning requirements, including touchup painting.
 7. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Contractor shall submit a written request for inspection for Substantial Completion. On receipt of request, Architect/Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect/Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's Punch List or additional items identified by Architect/Engineer, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.04 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, Contractor shall complete the following:
1. Submit a final Application for Payment.
 2. Submit certified copy of Architect/Engineer's Substantial Completion inspection of Punch List of items to be completed or corrected, endorsed and dated by Architect/Engineer. The certified copy of the Punch List shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Contractor shall submit a written request for final inspection for acceptance. On receipt of request, Architect/Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect/Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.05 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Contractor shall submit three copies of Punch List. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

Include the following information at the top of each page:

- a. Project name
- b. Date
- c. Name of Architect/Engineer
- d. Name of Contractor
- e. Page number

1.06 WARRANTIES

- A. Submittal Time: Contractor shall submit written warranties on request of Architect/Engineer for designated portions of the Work where commencement of warranties other than date of Final Completion is indicated.
- B. Partial Occupancy: Contractor shall submit properly executed warranties within Fifteen (15) days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Contractor shall organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.

Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

- D. Contractor shall Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cleaning Agents: Contractor shall use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.01 FINAL CLEANING

- A. General: In addition to Cleaning requirements in Section 010000 General Conditions §1.45, Contractor shall provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Contractor shall employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
- C. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - 1. Clean Project Site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances. Rubbish shall not be thrown from building openings above the ground floor unless contained within chutes.
 - 2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - 3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - 4. Remove tools, construction equipment, machinery, and surplus material from Project Site.
 - 5. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - 6. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - 7. Remove labels that are not permanent.
 - 8. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 9. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - 10. Remove putty stains from glass and mirrors; wash and polish inside and outside.
 - 11. Remove marks, undesirable stains, fingerprints, other soil, dust or dirt from painted, decorated or stained woodwork, plaster or plasterboard, metal acoustic tile and equipment surfaces.

12. Remove spots, paint and soil from resilient, glazed and unglazed masonry and ceramic flooring and wall Work.
 13. Remove temporary floor protections, clean, wash or otherwise treat and/or polish, as directed, all finished floors.
 14. Clean exterior and interior metal surfaces, including doors and window frames and hardware of oil stains, dust, dirt, paint and the like, polish where applicable and leave without fingerprints or blemishes.
 15. Be responsible for the proper cleaning of all equipment furnished under this Contract and for the removal of rubbish, packing cases and debris.
 16. Restore the areas of the building or the Site, damaged by its Work, to its original condition.
 17. Restore all landscaping, roadway and walkways to preexisting condition. Damage to trees and plantings shall be repaired in the next planting season, and such shall be guaranteed for one year from date of repair and/or replanting.
- D. Contractor shall comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project Site and dispose of lawfully.

END OF SECTION 017700

SECTION 017823 – OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.

1.02 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section Submittals. Contractor shall submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect/Engineer will comment on whether content of operations and maintenance Submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Contractor shall submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect/Engineer.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft Submittals.
 - 2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect/Engineer will return two copies.
- C. Manual Submittal: Contractor shall submit each manual in final form prior to requesting inspection for Substantial Completion and at least Fifteen (15) Days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within Fifteen

(15) Days of receipt of Architect/Engineer's and Commissioning Authority's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.01 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Directory: Contractor shall prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.
- B. Organization: Contractor shall unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page
 - 2. Table of contents
 - 3. Manual contents
- C. Title Page: Contractor shall include the following information:
 - 1. Subject matter included in manual
 - 2. Name and address of Project
 - 3. Name and address of Owner
 - 4. Date of Submittal
 - 5. Name and contact information for Contractor
 - 6. Name and contact information for Architect/Engineer
 - 7. Name and contact information for Commissioning Authority
 - 8. Names and contact information for major consultants to the Architect/Engineer that designed the systems contained in the manuals
 - 9. Cross-reference to related systems in other operation and maintenance manuals
- D. Table of Contents: Contractor shall list each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number.
- E. Manual Contents: Contractor shall organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- F. Manuals, Electronic Files: Contractor shall submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- G. Manuals, Paper Copy: Contractor shall submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.02 EMERGENCY MANUALS

- A. Content: Contractor shall organize manual into a separate section for each of the following:
1. Type of emergency
 2. Emergency instructions
 3. Emergency procedures

- B. Type of Emergency: Contractor shall, where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire
 2. Flood
 3. Gas leak
 4. Water leak
 5. Power failure
 6. Water outage
 7. System, subsystem, or equipment failure
 8. Chemical release or spill
- C. Emergency Instructions: Contractor shall describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, Supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping
 2. Shutdown instructions for each type of emergency
 3. Operating instructions for conditions outside normal operating limits
 4. Required sequences for electric or electronic systems
 5. Special operating instructions and procedures

2.03 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, Contractor shall include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor is delegated design responsibility
 3. Operating standards
 4. Operating procedures
 5. Operating logs
 6. Wiring diagrams

7. Control diagrams
 8. Piped system diagrams
 9. Precautions against improper use
 10. License requirements including inspection and renewal dates
- B. Descriptions: Contractor shall include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents
 2. Manufacturer's name
 3. Equipment identification with serial number of each component
 4. Equipment function
 5. Operating characteristics
 6. Limiting conditions
 7. Performance curves
 8. Engineering data and tests
 9. Complete nomenclature and number of replacement parts
- C. Operating Procedures: Contractor shall include the following, as applicable:
1. Startup procedures
 2. Equipment or system break-in procedures
 3. Routine and normal operating instructions
 4. Regulation and control procedures
 5. Instructions on stopping
 6. Normal shutdown instructions
 7. Seasonal and weekend operating instructions
 8. Required sequences for electric or electronic systems
 9. Special operating instructions and procedures
- D. Systems and Equipment Controls: Contractor shall describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Contractor shall diagram piping as installed and identify color-coding where required for identification.

2.04 PRODUCT MAINTENANCE MANUALS

- A. Content: Contractor shall organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: Contractor shall list each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or Supplier and maintenance service agent, and cross-reference Specification Section number and title.
- C. Product Information: Contractor shall include the following, as applicable:
 - 1. Product name and model number
 - 2. Manufacturer's name
 - 3. Color, pattern, and texture
 - 4. Material and chemical composition
 - 5. Reordering information for specially manufactured products
- D. Maintenance Procedures: Contractor shall include manufacturer's written recommendations and the following:
 - 1. Inspection procedures
 - 2. Types of cleaning agents to be used and methods of cleaning
 - 3. List of cleaning agents and methods of cleaning detrimental to product
 - 4. Schedule for routine cleaning and maintenance
 - 5. Repair instructions
- E. Repair Materials and Sources: Contractor shall include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Contractor shall include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.05 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: Contractor shall for each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: Contractor shall list each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number

of Installer or Supplier and maintenance service agent, and cross-reference Specification Section number and title.

- C. **Manufacturers' Maintenance Documentation:** Contractor shall provide manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly
 - 3. Identification and nomenclature of parts and components
 - 4. List of items recommended to be stocked as spare parts
- D. **Maintenance Procedures:** Contractor shall include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions
 - 2. Troubleshooting guide
 - 3. Precautions against improper maintenance
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions
 - 5. Aligning, adjusting, and checking instructions
 - 6. Demonstration and training video recording, if available
- E. **Maintenance and Service Schedules:** Contractor shall include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. **Spare Parts List and Source Information:** Contractor shall include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. **Maintenance Service Contracts:** Contractor shall include copies of maintenance agreements with name and telephone number of service agent.
- H. **Warranties and Bonds:** Contractor shall include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.01 MANUAL PREPARATION

- A. **Emergency Manual:** Contractor shall assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

- B. Product Maintenance Manual: Contractor shall assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Contractor shall assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed, Contractor shall mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- E. Drawings: Contractor shall prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Project Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
- F. Contractor shall comply with Section 017700 Closeout Procedures for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 – PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings
 - 2. Record Specifications
 - 3. Record Product Data
- B. Related Sections include the following:
 - 1. Section 011000 Summary of Work for coordinating Project Record Documents covering the Work of multiple contracts.
 - 2. Section 017700 Closeout Procedures for general closeout procedures.
 - 3. Section 017823 Operation and Maintenance Data for operation and maintenance manual requirements.
 - 4. Divisions 02 through 26 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.03 SUBMITTALS

- A. Record Drawings: Contractor shall comply with the following:
 - 1. Number of Copies: Submit One (1) set(s) of marked-up Record Prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Final Submittal: Submit One (1) set(s) of marked-up Record Prints, One (1) set(s) of Record Transparencies, and Four (4) copies printed from Record Transparencies. Print each Drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Contractor shall submit One (1) copy of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Contractor shall submit Five (5) copies of each Product Data Submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of Submittal as Record Product Data.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS

- A. Record Prints: Contractor shall maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, Subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings
 - b. Revisions to details shown on Drawings
 - c. Depths of foundations below first floor
 - d. Locations and depths of underground utilities
 - e. Revisions to routing of piping and conduits
 - f. Revisions to electrical circuitry
 - g. Actual equipment locations
 - h. Duct size and routing
 - i. Locations of concealed internal utilities
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect/Engineer's written orders
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, Contractor shall review marked-up Record Prints with Architect/Engineer. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and Shop Drawings.
1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
 2. Refer instances of uncertainty to Architect/Engineer for resolution.
 3. Owner will furnish Contractor one set of transparencies of the Contract Drawings for use in recording information.
 4. Print the Contract Drawings and Shop Drawings for use as Record Transparencies. Architect/Engineer will make the Contract Drawings available to Contractor's print shop.
- C. Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, Contractor shall review marked-up Record Prints with Architect/Engineer. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:
1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
 2. Format: DWG Version, operating in Microsoft Windows operating system.
 3. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
 4. Refer instances of uncertainty to Architect/Engineer for resolution.
 5. Architect/Engineer will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.
 - a. Architect/Engineer makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
- D. Newly Prepared Record Drawings: Contractor shall prepare new Drawings instead of preparing Record Drawings where Architect/Engineer determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Architect/Engineer for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- E. Format: Contractor shall identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
 3. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
 4. Identification: As follows:
 - a. Project name
 - b. Date
 - c. Designation "PROJECT RECORD DRAWINGS"
 - d. Name of Architect/Engineer
 - e. Name of Contractor

2.02 RECORD SPECIFICATIONS

- A. Preparation: Contractor shall mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and Contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, Supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.

5. Note related Change Orders and Record Drawings where applicable.

2.03 RECORD PRODUCT DATA

- A. Preparation: Contractor shall mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data Submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project Site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders and Record Drawings where applicable.

2.04 MISCELLANEOUS RECORD SUBMITTALS

- A. Contractor shall assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and Submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

- A. Recording: Contractor shall maintain one copy of each Submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Contractor shall store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect/Engineer's and DPMC Representative reference during normal working hours.

END OF SECTION 017839

SECTION 024100 – DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Division 1 – General Requirements

1.02 SUMMARY

- A. Section Includes:

- 1. Required demolition as indicated on the drawings.

1.03 SUBMITTALS

- A. Proposed Demolition Activities:

- 1. Submit proposed schedule of demolition activities. Indicate:
 - a. Starting and ending dates for each activity as appropriate.
 - b. Interruption and restoration of utility services.
 - 2. Submit proposed methods of operations.
 - 3. Submit proposed dust control measures.
 - 4. Submit proposed noise control measures.

- B. Photographs: Before starting work, file photographs documenting existing conditions that later could be mistaken for damage caused by demolition operations with the Architect.

- C. Project Record Documents:

- 1. Identify location of capped utilities.
 - 2. Indicate unanticipated structural, electrical, or mechanical conditions.

1.04 QUALITY ASSURANCE (NOT USED)

1.05 PROJECT CONDITIONS

- A. Occupancy:

- 1. Demolition will not occur while building is operational.

- B. Existing Conditions:

- 1. After the project has begun, the contractor is responsible for the condition of structures in which demolition occurs. The owner does not warrant that the condition of structures will not have changed since the time of inspection for bidding purposes.

2. The owner reserves the right to remove and salvage portions of the structure prior to the start of demolition.
- C. Unforeseen Conditions: Should unforeseen conditions be encountered that affect design or function of project, investigate fully and submit an accurate, detailed, written report to the architect. While awaiting the architect's response, reschedule operations as necessary to avoid delay of overall project.

1.06 SEQUENCING AND SCHEDULING

- A. Arrange schedule so as not to interfere with the owner's daily operations and that of the facility.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that utilities to be disturbed during construction have been disconnected and sealed.
- B. Survey existing conditions and correlate with drawings and specifications to determine extent of demolition required.
- C. Insofar as is practicable, arrange operations to reveal unknown or concealed structural conditions for examination and verification before removal or demolition.
- D. Perform continuing surveys as the work progresses to detect hazards resulting from demolition or construction activities. Notify Architect and Owner immediately and in writing of unforeseen conditions as work progresses.

3.02 PREPARATION

- A. Traffic: Do not obstruct walks or public ways without the written permission of governing authorities and of the owner. Where routes are permitted to be closed, provide alternate routes if required.
- B. Protection:
 1. Provide for the protection of persons passing around or through the area of demolition.
 2. Perform demolition so as to prevent damage to adjacent improvements and facilities to remain.
 3. Provide protective measures to ensure free and safe passage of persons to and from occupied areas.
 4. Erect temporary protection such as walks, fences, railings, canopies, etc., where required by authorities having jurisdiction.
 5. Protect other new or existing work from damage during demolition operations.

- C. Damages: Without cost to the owner and without delay, repair any damages caused to facilities to remain.

3.03 UTILITY SERVICES

- A. Arrange with utility companies and shut off any utilities to be disturbed during construction. Notify Owner and Architect in writing prior to utilities being shut off.
- B. Disconnect and cap indicated utilities before starting demolition operations.
- C. Identify location of capped utilities on project record documents.
- D. No interruption of utilities will be permitted.
 - 1. Provide temporary utilities when existing utilities are interrupted.

3.04 EXPLOSIVES

- A. Do not use explosives.

3.05 POLLUTION CONTROLS

- A. Control as much as practicable the spread of dust and dirt.
- B. Observe regulations set forth by the Environmental Protection Agency (EPA).
- C. Do not allow water usage which results in freezing or flooding.
- D. Do not allow adjacent improvements to remain to become soiled by demolition operations.

3.06 DEMOLITION - GENERAL

- A. Remove: Unless items are otherwise indicated to be reinstalled or salvaged, remove and dispose of in an appropriate manner.
- B. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare for service; reinstall in the location indicated. If the item is to be stored, store in a clean, dry safe place as to protect from damage.
- C. Remove and Install New: Remove and dispose of items (in an appropriate manner) indicated and install new items in the same location (or in the location indicated).
- D. Remove and Salvage: Items indicated to be salvaged will remain the owner's property. Carefully remove and clean items indicated to be salvaged; pack or crate to protect against damage; identify contents of containers; deliver to the locations indicated.
- E. Remove and Discard: Remove and dispose of items indicated in an appropriate manner.
 - 1. All demolished or removed items and materials shall be considered scrap except for those indicated to remain, those indicated to be reinstalled, and those indicated to be salvaged.
 - 2. Items of value to the contractor:

- a. The contractor may provide for temporary storage on site, if approved by the architect.
 - b. Remove all items from site when requested by the architect or the owner.
 - c. On-site sale of removed items is prohibited.
 - d. The owner reserves the right to keep any items he or she deems of value.
- F. Existing to Remain: Construction or items indicated to remain shall be protected against damage during demolition operations. Where practicable, and with the engineer's permission, the contractor may elect to remove items to a suitable storage location during demolition and then properly clean and reinstall the items.
- G. Perform work in a systematic manner.
- H. Demolish and remove existing construction only to the extent required by new construction and as indicated in the contract documents.
- I. Perform selective demolition using methods which are least likely to damage work to remain and which will provide proper surfaces for patching.
- J. Remove debris from work area daily, and discard of in an approved manner.
- K. Use any methods permitted by governing regulations and the requirements of the contract documents.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

- A. Promptly dispose of materials resulting from demolition operations. Do not allow materials to accumulate on site.
- B. Transport materials resulting from demolition operations and legally dispose of off-site.
- C. Burning of removed materials on project site is prohibited.
- D. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

3.08 CLEANING

- A. Remove tools and equipment. Dispose of scrap materials.
- B. Leave exterior areas free of debris.

END OF SECTION 024100

SECTION 035416 – CEMENT-BASED, INTERIOR, SELF LEVELING UNDERLAYMENT

PART 1 - GENERAL

1.01 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. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

- A. Cement-based, interior, self-leveling underlayment.

1.03 SECTION INCLUDES

- A. Cement-based, interior, self-leveling underlayment used to create a smooth, flat or level surface prior to the installation of floor coverings.
 - 1. Cement-based, interior, self-leveling underlayment
 - 2. Primer
 - 3. Vapor mitigation product
 - 4. Fiber reinforcement material
 - 5. Finishing underlayment compound
- B. Related Sections include the following:
 - 1. Division 09 Flooring Sections

1.04 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with all applicable requirements and standards.
- D. ASTM C109M, Compressive Strength Air-Cure Only
- E. ASTM C348, Flexural Strength of Hydraulic Cement Mortars
- F. ASTM C190, Method of Test for Tensile Strength of Hydraulic Cement Mortars
- G. ASTM C1583, Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension

- H. ASTM C4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
- I. ASTM F2170, Relative Humidity in Concrete Floor Slabs Using in situ Probes
- J. ASTM F1869, Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- K. ASTM 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- L. Resilient Floor Covering Institute booklet "Recommended Work Practices for the Removal of Resilient Floor Coverings"

1.05 QUALITY ASSURANCE

- A. Installation of CMP SPECIALTY PRODUCTS LEVEL-1 must be by a trained applicator regularly engaged and properly equipped for application of concrete floor underlayment. Please contact your local CMP SPECIALTY PRODUCTS distributor for a list of Installers.
- B. Product shall be able to be installed from ¼ inch to 3 inches thickness neat and up to 5-inches properly extended with aggregate over well-defined areas.
- C. Product shall be formulated to develop a compressive strength of 5000 psi when tested in accordance with ASTM C109/modified for air-cured conditions.
- D. Product shall be able to be covered by thinset ceramic tile in 24 hours, water-based sealers and adhesives for standard coverings in 48 hours, epoxy or urethane adhesives and moisture sensitive coverings in 3 to 5 days. For application of epoxy coatings < 20 mils: 24 hours and high build epoxy coatings > 20 mils: 5 to 7 Days. Always ensure underlayment is totally dry especially when using moisture sensitive adhesive and floor coverings.
- E. Product produces a hard-durable surface that can be left open to normal construction traffic for up to one year before the installation of finished flooring. CMP SPECIALTY PRODUCTS LEVEL-1 can be feather edged to meet existing transitions.

1.06 SUBMITTALS

- A. Product Data: Product data in the form of technical data, specifications, and installation instructions.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original undamaged packages or acceptable bulk containers.
- B. Store packaged materials to protect them from elements or physical damage.
- C. Do not use which shows indications of moisture damage, caking, or other signs of deterioration.

1.08 PROJECT CONDITIONS

- A. Do not place the product when ambient temperature is below 50 degrees F (10 degrees C) or above 95 degrees F (35 degrees C).

PART 2 – PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MATERIALS

- A. Self-Leveling Underlayment: Free-flowing, self-leveling, pumpable, cement-based compound for applications from 1/4 inch to 3 inches. Applications up to 5 inches in thickness properly extended with aggregate.

BASIS OF DESIGN

- 1. CMP SPECIALTY PRODUCTS “LEVEL-1”
 - a. Flow Working Time: 25 minutes
 - b. Final Set: Approximately 90 minutes, ASTM C191
 - c. Compressive Strength:
 - i. 1500 psi at 1 day, ASTM C109M
 - ii. 3000 psi at 7 days, ASTM C109M
 - iii. 5000 psi at 28 days, ASTM C109M
 - d. Flexural Strength: 1000 psi at 28 days, ASTM 348
 - e. Tensile Strength: 520 psi at 28 days, ASTM C190
 - f. VOC: 0g/L, calculated SCAQMD 1168
 - 2. Architect Approved Equal
- B. Underlayment Primer: Premium primer designed for use with CMP’s line of underlayments and toppings.
 - 1. CMP SPECIALTY PRODUCTS “AS-100”
 - 2. CMP SPECIALTY PRODUCTS “LOCKDOWN” with sand broadcast. Note: CMP SPECIALTY PRODUCTS LOCK DOWN with sand broadcast is required for applications subject to dynamic rolling loads and when CMP SPECIALTY PRODUCTS LEVEL-1 is used as a prefill for CMP SPECIALTY PRODUCTS DIAMOND CAP installations.
 - C. Vapor Mitigation and Remediation Product: 100% solids, two-component, resin based, membrane forming, moisture mitigation system.
 - 1. CMP SPECIALTY PRODUCTS “LOCKDOWN”
 - D. Redispersible Fiber Mat: Fiber reinforcement mat for use with wood, unstable and distressed subfloors.

1. CMP SPECIALTY PRODUCTS "MEDIMAT"
- E. Finishing Underlayment Compound: Trowelable, cement-based smoothing compound for applications from feather edge to ½ inch thick.
 1. CMP SPECIALTY PRODUCTS "PREPSTAR"
- F. Polished, Self Leveling Topping: Calcium Aluminate/Portland cement based self-leveling topping for applications from 1/4 inch to 2 inches thickness and suitable to receive a mechanical concrete polish process.
 1. CMP SPECIALTY PRODUCTS DIAMOND CAP
- G. Self Leveling Topping: Premium free-flowing, self-leveling, pumpable, calcium aluminate/Portland cement-based compound for applications from 1/8 inch to 1/2 inch thickness.
 1. CMP SPECIALTY PRODUCTS LIQUICEM
- H. Aggregate: For extension on CMP SPECIALTY PRODUCTS LEVEL-1 in 3 inch to 5 inch thick applications.

2.03 MIXING EQUIPMENT

- A. Provide suitable batch type mechanical mixer for mixing topping material at the Project Site. Equip batch mixer with a suitable charging hopper, water storage tank, and a water-measuring device. Use only mixers which are capable of mixing aggregates, cement, and water into a uniform mix within specified time, and of discharging mix without segregation.
- B. Provide suitable mixing-pump such as m-tec, Duo 2000 which includes dual mixing action and wet material probe for consistent mix water monitoring.
- C. Provide a suitable barrel, to mix 2-bag batches of product. Provide a suitable dispensing container for measuring a maximum 5.5 quarts of clean cold water for each bag of product. Provide a heavy duty 1/2" drill (min. 850 rpm) with product mixing wand to mix product to a lump free consistency without entraining excess air.

PART 3 - EXECUTION

3.01 PREPARATION (BASIS OF DESIGN PRODUCT)

- A. Concrete subfloors: Prepare substrate in accordance with CMP SPECIALTY PRODUCTS' instructions.
 1. Refer to ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring before proceeding.
 2. Concrete subfloors must be sound, clean and free of all dirt, oil, grease, laitance, curing compounds and any substance that may act as a bond breaker. If necessary, mechanically clean and remove contaminants by chipping, shot-blasting, grinding or scarifying. Removal with solvents, strippers and acid etching are not acceptable.

3. All cracks in the subfloor must be repaired or treated to minimize crack telegraphing through the underlayment/topping. Moving cracks, working cracks, expansion joints and isolation joints must be honored through the applied CMP SPECIALTY PRODUCTS LEVEL-1.
 4. Substrates shall be inspected and tested for moisture in accordance with ASTM F1869 and/or ASTM 2170. Substrates must be corrected for moisture or any other conditions that could affect the underlayment/topping performance or finished floor covering. Utilize CMP SPECIALTY PRODUCTS LOCKDOWN topical moisture vapor mitigation system where moisture and vapor emissions exceed the floor covering manufacturer's required limits.
- B. Wooden subfloors: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat.
1. Must be a minimum of $\frac{3}{4}$ inch, untreated, APA Rated, Type-1, exterior grade plywood, OSB or equal. The subfloor must be free of deflection (L/360 maximum) considering both live and dead loads. Subfloor must be clean, sound and free of all foreign matter that will inhibit bond.
 2. Prepare by sanding down to bare wood. Secure loose boards with deck screws and fill open seams with CMP SPECIALTY PRODUCTS PREPSTAR. Replace any weak or water damaged wood.
 3. Use an approved anti-fracture membrane over CMP SPECIALTY PRODUCTS LEVEL-1 in areas where Ceramic Tile or Stone are being installed.
- C. Non-Porous floors: Epoxy, Terrazzo, and ceramic and quarry tile must be abraded to a dull finish. Vacuum or wet vacuum the surface to remove dust and laitance.
- D. Adhesive residue: Thin, translucent adhesive residue must be non-water soluble, free of tack and well bonded to the substrate. The adhesive Cutback must be prepared using the wet scrape method as outlined in the Resilient Floor Covering Institute booklet "Recommended Work Practices for the Removal of Resilient Floor Coverings". Remove all patching materials below the adhesive and avoid applications where heat or excessive moisture will soften or degrade the adhesive. If unsure about the suitability, deflection or if heavy loads are expected, use the VERY DISTRESSED SUBFLOORS Application Method below.
- E. Very distressed subfloors: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat for use with wood, unstable and distressed subfloors.
1. ALL substrates must be clean, dry, between 50° and 95°F (10° and 30°C) and free of oil, loose (floorcovering, patching compounds or surface material). Remaining materials must be unaffected by the moisture incurred from the placement of self-leveling. Never use Acid or Mastic Removers on any surface to which a CMP product will be applied.
- F. Gypsum substrates: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat.
1. Remove all loose debris from subfloor. Sweep and vacuum the substrate.

- G. Metal substrates: Substrate must be prepared by abrasive cleaning to a White metal finish, structurally sound and free of deflection (L/360 maximum). Remove all residue using a dry cleaning method or wipe down with Xylene.

3.02 INSTALLATION (BASIS OF DESIGN PRODUCT)

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with CMP SPECIALTY PRODUCTS published recommendations.
- C. Concrete subfloors: Apply one coat of CMP SPECIALTY PRODUCTS AS-100 diluted 50/50 (1 part water: 1 part CMP SPECIALTY PRODUCTS AS-100) using a split tip broom. Pour out and work into surface leaving no puddles or bare spots. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 1 hour) and up to 24 hours. If primer has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.
- E. Non-Porous floors: Apply one thin coat of CMP SPECIALTY PRODUCTS AS-100 (Undiluted) using a ¼ inch nap roller. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 1 hour) and up to 24 hours. If CMP SPECIALTY PRODUCTS AS-100 has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.
- F. Adhesive residue: Apply one thin coat of CMP SPECIALTY PRODUCTS AS-100 (Undiluted) using a 3/8 inch nap roller. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 2 hours) and up to 24 hours. If CMP SPECIALTY PRODUCTS AS-100 has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.
- G. Very distressed subfloors: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat.
 - 1. Apply one thin coat of CMP SPECIALTY PRODUCTS AS-100 (Undiluted) using a 3/8 inch nap roller. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 2 hours) and up to 24 hours. If CMP SPECIALTY PRODUCTS AS-100 has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.
 - 2. Roll out CMP SPECIALTY PRODUCTS MEDIMAT™ over the properly prepared and primed surface. Overlap all seams a minimum of 1 inch and cut to fit using scissors. A single layer of CMP SPECIALTY PRODUCTS MEDIMAT™ can be used to reinforce CMP SPECIALTY PRODUCTS LEVEL-1 applications up to 1 inch thick. Place an additional layer of mat for thicknesses up to 2 inches. Mat installation does not need to be “Wrinkle Free” as the product breaks down into individual fibers after the CMP SPECIALTY PRODUCTS LEVEL-1 is placed.
 - 3. Place a minimum of ½ inch of CMP SPECIALTY PRODUCTS LEVEL-1 over CMP SPECIALTY PRODUCTS MEDIMAT.

4. Once the mat is covered, gauge rake. Working the underlayment in a crosshatch pattern with a CMP SPECIALTY PRODUCTS Porcupine or Agitating Roller may be required to properly disperse the fiber; fibers should be visible in the CMP SPECIALTY PRODUCTS LEVEL-1. Pouring or pumping the self-leveling back into already placed material will help in dispersing the fibers.
5. Finish with a CMP SPECIALTY PRODUCTS smoother.
6. Depending on the sensitivity of finished covering, sanding or skim coating using CMP SPECIALTY PRODUCTS PREPSTAR trowelable underlayment or capping with CMP SPECIALTY PRODUCTS LEVEL-1 or CMP SPECIALTY PRODUCTS LIQUICEM may be required to suppress any residual fiber texture remaining in the CMP SPECIALTY PRODUCTS LEVEL-1.

3.03 MIXING (BASIS OF DESIGN PRODUCT)

- A. Use CMP SPECIALTY PRODUCTS mixing drum, to mix 2-bag batches of CMP SPECIALTY PRODUCTS LEVEL-1. Add a maximum 5.5 quarts of clean cold water for each bag of CMP SPECIALTY PRODUCTS LEVEL-1 to the mixing drum or barrel. Then, add bags of CMP SPECIALTY PRODUCTS LEVEL-1 while mixing at full speed with a CMP SPECIALTY PRODUCTS mixing wand attached to a heavy duty ½ inch drill (min. 850 rpm). Mix for 2 minutes or until lump free. Add no additional water and keep the mixing wand immersed in the material to avoid entraining excess air.
- B. Aggregate mix: For installation areas over 2 inches (5 cm) in thickness, up to 1 part by volume of well graded, washed pea gravel must be added. Aggregates should be hard, high density and non-absorbent. Before attempting to use any aggregate, conduct testing to determine suitability. All aggregate should be clean and dry. Do not use sand or exceed 1 part aggregate by volume. Combine aggregate once material is lump free and mix until aggregate is completely coated. Aggregate addition will diminish workability and may make it necessary to install a finish layer. Allow the first installation to dry 12 to 16 hours before topping.
- C. For pump installations, please contact CMP SPECIALTY PRODUCTS for instructions, recommended pumping procedures and approved equipment.

3.04 PLACING (BASIS OF DESIGN PRODUCT)

- A. Place underlayment in accordance with CMP SPECIALTY PRODUCTS' instructions, using equipment and procedures to facilitate continuous placement, avoid segregation of mix and prevent excessive air content. Pour or pump, gauge rake with a CMP SPECIALTY PRODUCTS gauge rake and smooth with a CMP SPECIALTY PRODUCTS smoother in a continuous operation until an entire panel or section of floor area are completed. Do not work mix except for raking or smoothing.

3.05 CURING AND PROTECTION (BASIS OF DESIGN PRODUCT)

- A. Cure and protect CMP SPECIALTY PRODUCTS LEVEL-1 underlayment/topping applications and finishes as specified CMP SPECIALTY PRODUCTS. CMP SPECIALTY PRODUCTS LEVEL-1 is self-curing. Do not use cure & seals or any other curing methods.

- B. During application and for the first 24 hours, prevent excessive air movement but maintain adequate ventilation and protect material from direct sunlight to prevent uneven curing patterns, false set and cracking.

3.06 PERFORMANCES (BASIS OF DESIGN PRODUCT)

- A. Failure of CMP SPECIALTY PRODUCTS LEVEL-1 to bond to substrate, or disintegration or other failure of topping to perform as a floor underlayment or topping compound will be considered failure of materials and/or workmanship. Repair or replace CMP SPECIALTY PRODUCTS LEVEL-1 in areas of such failures, as directed by CMP SPECIALTY PRODUCTS.

END OF SECTION 035416

SECTION 040110 – MASONRY CLEANING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cleaning existing concrete masonry
- B. Cleaning new concrete masonry

1.2 RELATED SECTIONS

- A. Section 040120 – Unit Masonry Restoration.

1.3 REFERENCES

- A. ASTM D 3960 - Standard Practice for Determining Volatile Organic Compound Content of Paints and Related Coatings; 1996.

1.4 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Manufacturer's printed literature for each product, including test data indicating compliance with requirements, and installation instructions.
- C. Restoration Plan: Written description of restoration process, including materials, methods, equipment, and sequencing of work.
- D. Cleaning Plan: Written description of cleaning process, including materials, methods, equipment, and sequencing of work.
- E. Installer's qualifications.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Capable of providing field service representation during installation and who will approve the installer and application method.
- B. Installer Qualifications: Installer experienced in performing this type of work and who has specialized in work similar to the type required for this project.
- C. Test Panels: Before full-scale application, test products to be used on test panels OR an inconspicuous location on the building as directed by the Construction Manager.
 - 1. Review manufacturer's Product Data to determine suitability of each product for each surface.
 - 2. Apply products using manufacturer-approved application methods, determining actual requirements for application.
 - 3. After 48 hours, review effectiveness of cleaning or treatment, compatibility with substrates, and ability to achieve desired results.
 - 4. Obtain approval by Architect and Owner of workmanship, color, and texture

before proceeding with work.

5. Test Panels: Inconspicuous sections of actual construction.

- a. Location and number as selected by Architect.
- b. Size; 4 feet by 4 feet.
- c. Repair unacceptable work to the satisfaction of the Architect and Owner.

D. Pre-Installation Meeting: Hold a meeting prior to starting application, to review project conditions, protection requirements, manufacturer's installation instructions and manufacturer's warranty requirements. See Section 013300 for additional requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in time to avoid construction delays.
- B. Deliver and store products in manufacturer's original packaging with identification labels intact.
- C. Store products protected from weather and at temperature and humidity conditions recommended by manufacturer.

1.7 PROJECT CONDITIONS

- A. Do not apply products under conditions outside manufacturer's requirements, which include:
 - 1. Surfaces that are frozen; allow complete thawing prior to installation.
 - 2. Surface and air temperatures below 40 degrees F (4 degrees C).
 - 3. Surface and air temperatures above 95 degrees F (35 degrees C).
 - 4. When surface or air temperature is not expected to remain above 40 degrees F (4 degrees C) for at least 8 hours after application.
 - 5. Wind conditions that may blow materials onto surfaces not intended to be treated.
 - 6. Less than 24 hours after a rain.
 - 7. When rain is expected less than 6 hours after installation.

1.8 WARRANTY

- A. See Division 1 for additional requirements.
- B. Provide manufacturer's standard warranty for not less than two (2) years commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:

Interior Renovations/
Village of Woodbury Building Department
Highland Mills, NY

040110-2

#4.1523.01

1. PROSOCO, Inc., Lawrence, KS
 2. "Safe n' Easy" products as manufactured by Dumond Chemical, NY, NY
 3. Diedrich Technologies, Inc., Milwaukee, WI
 4. Chemique, Inc., Moorestown, NJ
- B. Requests for substitutions will be considered in accordance with provisions of Division 1.

2.2 RESTORATION CLEANERS

- A. Cleaner for Removing Rust, Mud, Atmosphere Dirt, Mortar Smears and other Stains:
1. "Sure Klean® Vana Trol® Sensitive Brick and Stone Cleaner" as manufactured by PROSOCO, Inc.
 2. Or equal.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrates are acceptable for product installation; do not begin until substrates meet manufacturer's requirements.
- B. Do not begin until test panels have been approved by Architect.

3.2 PREPARATION

- A. Protect adjacent surfaces not to be treated prior to beginning application.
- B. Contractor shall take necessary precautions to collect restoration wash from dripping onto lower surfaces and properly dispose of collected waste product in accordance with the manufacturer's recommendations.
- C. On surfaces to be coated or treated, remove dirt, dust, oil, grease, and other contaminants that would interfere with penetration or performance of products; where cleaners are required, use products recommended by manufacturer; rinse thoroughly and allow to dry completely.

3.3 REPAIR OF CONCRETE MASONRY

- A. Refer to Specification Section 040120.

3.4 CLEANING EXISTING MASONRY

- A. Clean all exposed surfaces of masonry using materials specified, so that resulting surfaces have a uniform appearance.
- B. When cleaning stains and tough dirt, test masonry for composition and select appropriate cleaner in accordance with manufacturer's instructions and recommendations; use cleaner and cleaning methods selected to minimize damage to surfaces and deterioration of appearance.

C. Application: Mortar Smears on New Construction

1. Working from bottom to top, use clean water to thoroughly prewet surface to be cleaned.
2. Apply Sure Klean liberally using low-pressure spray (50 psi max), roller or densely filled (tampico) masonry washing brush. Do not apply with high-pressure spray. Do not atomize.
3. Let the cleaning solution dwell 3-5 minutes. Reapply. Light scrubbing of the surface improves cleaning results especially where high pressure rinsing equipment is not available. Do not let cleaning solution "dry into" the masonry. If solution starts to dry, reapply.
4. Rinse with clean water from the bottom to the top, covering each section of the surface with a concentrated stream of water. To avoid streaking on vertical walls, take care to keep the wall below wet and rinsed free of cleaner and residues.

D. Application: Old Concrete Masonry (Sure Klean® Light Duty Concrete Cleaner)

1. Before applying, read "Preparation" and "Safety Information" sections in the Manufacturer's Product Data Sheet for Light Duty Concrete Cleaner. Dilute Light Duty Concrete Cleaner concentrate with 2 to 6 parts water depending upon the substrate. Refer to Product Data Sheet for recommended dilution for intended use.
2. Working from the bottom to the top, always prewet surface with fresh water. When cleaning vertical surfaces, keep lower areas wet to avoid streaks.
3. Apply diluted cleaning solution directly to surface with recommended masonry brush or low-pressure spray.
4. Let cleaner stay on the surface for 3-5 minutes or until stains are gone. Do not allow cleaner to dry on the surface; staining may result. If drying occurs, lightly wet treated surfaces with fresh water and reapply in a gentle scrubbing manner. If treated surfaces are left unattended, keep people away from the cleaner.
5. Working from the bottom to the top, reapply cleaner and rinse thoroughly with fresh water to get all residues off the surface. If pressure-rinsing equipment is not available, brush the surface while rinsing with clean water. The best combination of rinsing pressure and water volume is provided by masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute delivered through a 15-45 degree fan spray tip. Equipment should be adjustable to reduce water flow rate and rinsing pressure as required for controlled cleaning of more sensitive surfaces. See also "Equipment" section of the Product Data Sheet.
6. Note: Multiple applications may etch acid-sensitive surfaces.

E. Application: Masonry (Sure Klean® Light Duty Restoration Cleaner)

1. Before applying, read "Preparation" and "Safety Information" sections in the Manufacturer's Product Data Sheet for Light Duty Restoration Cleaner. Do not dilute or alter.

2. Prewet the surface with clean water.
3. Apply cleaner using a brush or roller. Gently scrub to improve results.
4. Let cleaner dwell for 5 to 15 minutes. Gently scrub heavily soiled areas. Don't let cleaner dry on the surface. If drying occurs, lightly wet treated surfaces with fresh water. Reapply the cleaner in a gentle scrubbing manner.
5. Rinse thoroughly with clean water. The best combination of rinsing pressure and water volume is provided by masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute delivered through a 15-45 degree fan spray tip. Equipment should be adjustable to reduce water flow rate and rinsing pressure as required for controlled cleaning of more sensitive surfaces. See also "Equipment" section of the Product Data Sheet.
6. Repeat steps 1 through 4 above if necessary.

F. Cleanup

1. Clean tools and equipment using fresh water.

3.5 CLEANING EXISTING MASONRY

- A. Clean all exposed surfaces of masonry using materials specified, so that resulting surfaces have a uniform appearance.
- B. When cleaning stains and tough dirt, test masonry for composition and select appropriate
- C. Cleanup
 1. Clean tools and equipment using fresh water.
 2. Contractor shall collect and dispose of the after wash mix in accordance with the manufacturer's recommendations. Coordinate with the Owner and CM.

3.6 CLEANING AND PROTECTION

- A. At completion of work, remove protective coverings.
- B. If surfaces that should have been protected from damage by this work have been damaged, clean, repair or replace to the satisfaction of the Architect.
- C. Repair or replace damaged treated surfaces.
- D. Protect completed work from damage during construction.

END OF SECTION 040110

SECTION 040120 - UNIT MASONRY RESTORATION

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 maintenance of unit masonry consisting of brick clay masonry restoration and cleaning as follows:
 - 1. Mortar Analysis
 - 2. Repairing unit masonry, including replacing units.
 - 3. Repointing joints.
 - 4. Preliminary cleaning, including removing plant growth and painted surfaces.
 - 5. Cleaning exposed unit masonry.

1.3 UNIT PRICES

- A. Unit prices for masonry restoration and cleaning are specified in Division 01 Section "Unit Prices."
 - 1. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.
- B. Provide preconstruction testing as part of unit price.
- C. Remove and replace concrete block as part of exterior masonry repair / rebuilding.
- D. Clean concrete block, including preliminary and final cleaning, as part of masonry cleaning unit price.
- E. Repoint masonry as part of repointing masonry unit price.

1.4 DEFINITIONS

- A. Very Low-Pressure Spray: Under 100 psi.
- B. Low-Pressure Spray: 100 to 400 psi, 4 to 6 gpm.
- C. Medium-Pressure Spray: 400 to 800 psi, 4 to 6 gpm.
- D. High-Pressure Spray: 800 to 1200 psi, 4 to 6 gpm.
- E. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.
- B. Samples for Initial Selection for the following:
 - 1. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.
 - a. Have each set contain a close color range of at least three samples of different mixes of patching compound that matches the variations in existing masonry when cured and dry.
 - 2. Sealant Materials: See Division 07 Section "Joint Sealants."
 - 3. Include similar Samples of accessories involving color selection
- C. Samples for Verification: For the following:
 - 1. Each type of masonry unit to be used for replacing existing units. Include sets of Samples as necessary to show the full range of shape, color, and texture to be expected.
 - a. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.
 - 2. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.
 - a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
 - 3. Each type of masonry patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
 - 4. Sealant Materials: See Division 07 Section "Joint Sealants."
 - 5. Accessories: Each type of anchor, accessory, and miscellaneous support.
- D. Qualification Data: For restoration specialists; including field supervisors and restoration workers, chemical-cleaner manufacturer and testing service.
- E. Quality-Control Program.
- F. Restoration Program
- G. Cleaning Program

1.6 QUALITY ASSURANCE

- A. Restoration Specialist Qualifications: Engage an experienced stone restoration and cleaning firm to perform work of this Section. Firm shall have completed (5) projects similar in material, design, and extent to that indicated for this Project with at least a (10) record of successful in-service performance. Experience installing standard unit masonry or new stone masonry is not sufficient experience for stone restoration work.
1. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that stone restoration and cleaning work is in progress. Supervisors shall not be changed during Project except for causes beyond control of restoration specialist firm.
 2. Restoration Worker Qualifications: Persons who are experienced and specialize in restoration work of types they will be performing. When stone units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.
- B. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.
- C. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.
- D. 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 due to worker fatigue.
- E. Restoration Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials and Project site.
1. Include methods for keeping pointing mortar damp during curing period.
 2. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.
- F. Cleaning and Repair Appearance Standard: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.
1. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.
 2. Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect. Perform additional paint and stain removal, general

cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

- G. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.
1. Brick Repair: Prepare sample areas for each type of brick indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than 2 adjacent whole units or approximately 48 inches in least dimension. Erect sample areas in existing walls unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
 - a. Brick Repair & Replacement: Two brick repairs for each type of brick indicated to be repaired and/or replaced.
 2. Repointing: Rake out joints in 2 separate areas, each approximately 36 inches high by 48 inches wide for each type of repointing required and repoint one of the areas.
 3. Cleaning: Clean an area approximately 25 sq. ft. for each type of stone and surface condition.
 - a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not use cleaners and methods known to have deleterious effect.
 - b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.
 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.
- B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. 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.
- E. Store lime putty covered with water in sealed containers.
- F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.
- B. Repair masonry units and repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.
- C. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair 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.
- D. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.
- E. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.9 COORDINATION

- A. Coordinate masonry restoration and cleaning with public circulation patterns at Project site. Some work is near public circulation patterns. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.10 SEQUENCING AND SCHEDULING

- A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.
- B. Order sand and portland cement for pointing mortar immediately after approval of Samples. Take delivery of and store at Project site a sufficient quantity to complete Project.
- C. Perform masonry restoration work in the following sequence:
 - 1. Remove plant growth.
 - 2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 - 3. Remove paint.
 - 4. Clean masonry surfaces.
 - 5. Where water repellents, specified in Division 07, are to be used on or near masonry work, delay application of these chemicals until after pointing.
 - 6. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.

7. Repair masonry, including replacing existing masonry with new masonry materials.
 8. Rake out mortar from joints to be repointed.
 9. Point mortar and sealant joints.
 10. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
 11. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 12. Clean masonry surfaces.
- D. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units to comply with "Masonry Unit Patching" Article. Patch holes in mortar joints to comply with "Repointing Masonry" Article.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

- A. Face Brick: Provide face brick, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work.
1. Provide units with colors, color variation within units, surface texture, size, and shape to match existing brickwork and with physical properties as listed below:
 - a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II, white or gray or both where required for color matching of exposed mortar.
1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Factory-Prepared Lime Putty: ASTM C 1489.
- D. Quicklime: ASTM C 5, pulverized lime.
- E. Mortar Sand: ASTM C 144 unless otherwise indicated.
1. Color: Provide natural sand of color necessary to produce required mortar color.
 2. For pointing mortar, provide sand with rounded edges.

- 3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
- F. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.
- G. Water: Potable.

2.3 MANUFACTURED REPAIR MATERIALS

- A. Masonry Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching masonry.
 - 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. Cathedral Stone Products, Inc.; Jahn M100 Terra Cotta and Brick Repair Mortar.
 - b. Conproco Corporation; Mimic or Matrix.
 - c. Edison Coatings, Inc.; Custom System 45.
 - 2. Use formulation that is vapor- and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than the masonry units being repaired, and develops high bond strength to all types of masonry.
 - 3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
 - 4. Formulate patching compound used for patching brick in colors and textures to match each masonry unit being patched. Provide sufficient number of colors to enable matching the color, texture, and variation of each unit.

2.4 CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.
- C. Refer to Specification Section 040110 for appropriate cleaner.

2.5 ACCESSORY MATERIALS

- A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
 - 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. ABR Products, Inc.; Rubber Mask.
 - b. Price Research, Ltd.; Price Mask.
 - c. PROSOCO; Sure Klean Strippable Masking.

B. Sealant Materials:

1. Provide manufacturer's standard chemically curing, elastomeric sealant(s) of base polymer and characteristics indicated below that comply with applicable requirements in Division 07 Section "Joint Sealants."
2. Colors: Provide colors of exposed sealants to match colors of masonry adjoining installed sealant unless otherwise indicated.
3. Ground-Mortar Aggregate: Custom crushed and ground pointing mortar sand or existing mortar retrieved from joints. Grind to a particle size that matches the adjacent mortar aggregate and color. Remove all fines passing the 100 sieve.

C. Joint-Sealant Backing:

1. Refer to Specification Section 079200.

D. Setting Buttons: Resilient plastic buttons, non-staining to masonry, sized to suit joint thicknesses and bed depths of masonry units without intruding into required depths of pointing materials.

E. Masking Tape: Non-staining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.

F. Miscellaneous Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Little possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:
 - a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
 - b. Leave a residue on surfaces.

2.6 MORTAR MIXES

A. Mortar Analysis: General contractor to hire a conservator to perform a mortar analysis. A conservator regularly engaged in analyzing mortar mixes shall be hired to determine mortar compatibility and identify appropriate mortar selection. The following conservators are preapproved for this type of work:

1. J. Christopher Frey
Keystone Preservation Group
P.O. Box 831
Doylestown, PA 18901
Tel/Fax: 215-348-4919

2. Jablonski Building Conservation
40 West 27th street, Suite 1201
New York, NY 10001
Tel: 212-532-7775
Fax: 212-532-2188
www.jbconservation.com

3. Richbrook Conservation
P.O. Box 1061
New York, NY 10025
Tel: 646-315-5442
www.richbrook.net

B. Substitutions: If proposed equal is submitted, lab test to establish equivalent performance levels. Use an independent testing laboratory, as determined by the Specifier, and paid for by the submitting party.

C. Contractor shall assume that a minimum of (8) mortar analyses will be required.

2.7 CHEMICAL CLEANING SOLUTIONS

A. Refer to Specification Section 040110 for appropriate cleaner.

B. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical-cleaner manufacturer.

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.

1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

B. Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical-cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.

2. Keep wall wet below area being cleaned to prevent streaking from runoff.

3. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
 4. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
 5. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
- C. Prevent mortar from staining face of surrounding masonry and other surfaces.
1. Cover sills, ledges, and projections to protect from mortar droppings.
 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
 3. Immediately remove mortar in contact with exposed masonry and other surfaces.
 4. Clean mortar splatters from scaffolding at end of each day.
- D. Remove downspouts adjacent to masonry and store during masonry restoration and cleaning. Reinstall when masonry restoration and cleaning are complete.
1. Provide temporary rain drainage during work to direct water away from building.

3.2 BRICK REMOVAL AND REPLACEMENT

- A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated or are to be reused. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
1. When removing single bricks, remove material from center of brick and work toward outside edges.
- B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- D. Remove in an undamaged condition as many whole bricks as possible.
1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
 2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
 3. Store brick for reuse. Store off ground, on skids, and protected from weather.
 4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.
- E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

- F. Replace removed damaged brick with other removed brick in good quality, where possible, or with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.
- G. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
 - 1. Maintain joint width for replacement units to match existing joints.
 - 2. Use setting buttons or shims to set units accurately spaced with uniform joints.
- H. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
 - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
 - 2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.
 - 3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.3 MASONRY UNIT PATCHING

- A. Patch the following masonry units unless another type of replacement or repair is indicated:
 - 1. Units indicated to be patched.
 - 2. Units with holes.
 - 3. Units with chipped edges or corners.
 - 4. Units with small areas of deep deterioration.
- B. Remove and replace existing patches unless otherwise indicated or approved by Architect.
- C. Patching Bricks:
 - 1. Remove loose material from masonry surface. Carefully remove additional material so patch will not have feathered edges but will have square or slightly undercut edges on area to be patched and will be at least 1/4 inch thick, but not less than recommended by patching compound manufacturer.
 - 2. Mask adjacent mortar joint or rake out for repointing if patch will extend to edge of masonry unit.

3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
4. Rinse surface to be patched and leave damp, but without standing water.
5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
6. Place patching compound in layers as recommended by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the masonry unit. Shape and finish surface before or after curing, as determined by testing, to best match existing masonry unit.
8. Keep each layer damp for 72 hours or until patching compound has set.

3.4 WIDENING JOINTS

- A. Do not widen a joint, except where indicated or approved by Architect.
- B. Location Guideline: Where an existing masonry unit abuts another or the joint is less than 1/8 inch, widen the joint for length indicated and to depth required for repointing after obtaining Architect's approval.
- C. Carefully perform widening by cutting, grinding, routing, or filing procedures demonstrated in an approved mockup.
- D. Widen joint to width equal to or less than predominant width of other joints on building. Make sides of widened joint uniform and parallel. Ensure that edges of units along widened joint are in alignment with joint edges at unaltered joints.

3.5 CLEANING MASONRY, GENERAL

- A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.
- B. Use only those cleaning methods indicated for each masonry material and location.
 1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
 2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
 - a. Equip units with pressure gages.
 3. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.

4. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
 5. For high-pressure water-spray application, use fan-shaped spray tip that disperses water at an angle of at least 40 degrees.
 6. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
- C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.
- D. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.
- E. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.
- F. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.6 PRELIMINARY CLEANING

- A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.
- B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.
1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.

3.7 CLEANING MASONRY

- A. Detergent Cleaning:
1. Wet masonry with cold water applied by low-pressure spray.
 2. Scrub masonry with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that masonry surface remains wet.

3. Rinse with cold water applied by low pressure spray to remove detergent solution and soil.
- B. Mold, Mildew, and Algae Removal:
1. Wet masonry with cold water applied by low-pressure spray.
 2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
 3. Scrub masonry with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that masonry surface remains wet.
 4. Rinse with cold water applied by low pressure spray to remove mold, mildew, and algae remover and soil.
- C. Nonacidic Gel Chemical Cleaning:
1. Wet masonry with cold water applied by low-pressure spray.
 2. Apply nonacidic gel cleaner in 1/8-inch thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively so area will be uniformly covered with fresh cleaner and dwell time will be uniform throughout area being cleaned.
 3. Let cleaner remain on surface for period indicated below:
 - a. As recommended by chemical-cleaner manufacturer.
 - b. As established by mockup.
 4. Remove bulk of nonacidic gel cleaner by squeegeeing into containers for disposal.
 5. Rinse with cold water applied by low pressure spray to remove chemicals and soil.
- D. Nonacidic Liquid Chemical Cleaning:
1. Wet masonry with cold water applied by low-pressure spray.
 2. Apply cleaner to masonry in two applications by brush or low-pressure spray. Let cleaner remain on surface for period indicated below:
 - a. As recommended by chemical-cleaner manufacturer.
 - b. As established by mockup.
 - c. Two to three minutes.
 3. Rinse with cold water applied by low pressure spray to remove chemicals and soil.

3.8 REPOINTING MASONRY

- A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
 2. Joints where mortar is missing or where they contain holes.
 3. Cracked joints where cracks can be penetrated at least 1/4 inch by a knife blade 0.027 inch thick.
 4. Cracked joints where cracks are 1/16 inch or more in width and of any depth.
 5. Joints where they sound hollow when tapped by metal object.
 6. Joints where they are worn back 1/4 inch or more from surface.
 7. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
 8. Joints where they have been filled with substances other than mortar.
 9. Joints indicated as sealant-filled joints.
- B. Do not rake out and repoint joints where not required.
- C. Rake out joints as follows, according to procedures demonstrated in approved mockup:
1. Remove mortar from joints to depth of 1-1/2 times joint width, but not less than 1/2 inch or not less than that required to expose sound, unweathered mortar.
 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.
 - a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.
 - b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.
- D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- E. 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 thoroughly and allow it to become thumbprint hard before applying next layer.

3. After low areas have been filled to same depth as remaining joints, point all 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.
 - a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
 - b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

F. Pointing with Sealant:

1. After raking out, keep joints dry and free of mortar and debris.
2. Clean and prepare joint surfaces according to Division 07 Section "Joint Sealants." 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 according to Division 07 Section "Joint Sealants" and the following:
 - a. Install cylindrical sealant backing beneath the sealant, except where space is insufficient. There, install bond-breaker tape.
 - b. Install sealant using only proven installation techniques that will ensure that sealant will be 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 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. Immediately after first tooling, apply ground-mortar aggregate to sealant, gently pushing aggregate into the surface of sealant. Retool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant and aggregate from surfaces adjacent to joint.

- e. Do not allow sealant to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces, particularly rough textures. Remove excess and spillage of sealant promptly as the work progresses. Clean adjoining surfaces by the means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.

4. Cure sealant according to Division 07 Section "Joint Sealants."

- G. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.9 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, spray applied at low pressure.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.
- B. Wash adjacent woodwork and other non-masonry 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. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

END OF SECTION 040120

SECTION 054000 – COLD FORMED STEEL FRAMING

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Load bearing and non-load bearing metal wall framing.
 - 2. Metal floor and ceiling joist framing.
 - 3. Prefabricated metal roof trusses.
 - 4. Formed steel sections, 14 gauge and lighter, for use as bracing, bridging, tracks, furring and fastening.

1.2 REFERENCES

- A. AISI "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. AISI "Standard for Cold-Formed Steel Framing General Provisions."

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Engineer, fabricate, and erect cold formed steel framing and connections to withstand design loads within limits and under conditions required.
 - 1. Wall framing members shall withstand design loads without horizontal deflections greater than $1/360$ of the span.
 - 2. Wall framing members supporting masonry veneer shall withstand design loads without horizontal deflections greater than $1/600$ of the span.
- B. Design framing systems to accommodate movement of the structural framing without damage or overstress to members, connections or sheathing.
- C. Engineering Responsibility: Engage a cold formed steel framing manufacturer who utilizes a qualified professional engineer to prepare design calculations, shop drawings, and other structural data for steel joists.

1.4 SUBMITTALS

- A. Product Data: For each type of member, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Detail wall framing layout.
 - 2. Indicate component details including openings, anchorage, welding, fasteners and accessories required to complete installation.

3. Provide structural calculations signed and sealed by a professional engineer including loads and stresses for each component.
- C. Welding certificates.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 1. Power-actuated mechanical fasteners.
 2. Screw fasteners.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel" and AWS D1.3, "Structural Welding Code - Sheet Steel."

1.4 DELIVERY, STORAGE, AND HANDLING.

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Protect materials from corrosion, deformation and other damage during delivery, storage and handling. Protect members from exposure to harmful weather conditions with a ventilated waterproof covering.

PART 2 – PRODUCTS

2.1 COLD FORMED STEEL FRAMING

- A. Fabricate metal framing units from sheet steel conforming to ASTM A 1003.
 1. Finish: Galvanized, Class G60, minimum.
- B. Framing accessories: Fabricate from minimum 16 gauge steel sheet of the type and finish used for framing members. Provide manufacturer's standard configuration for the following accessories:
 1. Track channel
 2. Bridging
 3. Flat strapping
 4. Web stiffeners
 5. Joist hangers

2.2 FASTENINGS

- A. Self-drilling, self-tapping screws, bolts, nuts, and washers, ASTM A 90

- B. Anchorage devices: Hot dipped galvanized or stainless steel, including:
 - 1. Powder actuated fasteners
 - 2. Power driven anchor screws
 - 3. Drilled expansion bolts
 - 4. Screws with sleeves
- C. Welding: Conform to the requirements of AWS D1.1.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 ERECTION

- A. Install cold formed steel framing and accessories according to the requirements of ASTM C 1007 except where exceeded by other requirements.
- B. Join components by welding, screws, or bolts as recommended by the framing component manufacturer for the members to be joined.
- C. Wall Systems:
 - 1. Erect framing and panels plumb, level and square in strict accordance with approved shop drawings.
 - 2. Handle and lift prefabricated panels in a manner so as not to cause distortion in any member.
 - 3. Anchor runner track securely to the supporting structure as shown on the erection drawings. Install concrete anchors only after full compressive strength has been achieved. Provide a sill sealer or gasket barrier between all concrete and steel connections.
 - 4. Butt all track joints. Securely anchor abutting pieces of track to a common structural element, or butt-weld or splice them together.
 - 5. Align and plumb studs, and securely attach to the flanges or webs of both upper and lower tracks except when vertical movement is specified.
 - 6. Attach wall stud bridging in a manner to prevent stud rotation. Space bridging rows according to manufacturer's recommendations with a maximum spacing of 4'-0".
 - 7. Frame wall openings to include headers and supporting studs as shown in the drawings.

8. Provide temporary bracing until erection is completed.
9. Provide braced walls at locations indicated on plans as "shear walls" for frame stability and lateral load resistance.
10. As necessary provide for structural vertical movement using a vertical slide clip or other means in accordance with manufacturer's recommendations.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.4 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings with galvanized repair paint according to ASTM A 780 and manufacturer's instructions.

END OF SECTION 054000

SECTION 061000 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood blocking and nailers
2. Wood furring
3. Wood sleepers
4. Plywood Sheathing
5. Plywood backing panels

1.2 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative and fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood
2. Fire-retardant-treated wood
3. Power-driven fasteners
4. Powder-actuated fasteners
5. Expansion anchors
6. Metal framing anchors

1.3 QUALITY ASSURANCE

A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":

1. Dimension lumber framing
2. Miscellaneous lumber

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPAC2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPAC31 with inorganic boron (SBX).
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all rough carpentry, unless otherwise indicated.
 - 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.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPAC20 (lumber) and AWPAC27 (plywood).
 - 1. Use Exterior type for exterior locations and where indicated.
 - 2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
 - 3. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Application: Treat all rough carpentry, unless otherwise indicated.
 - 1. Framing for raised platforms
 - 2. Concealed blocking

3. Framing for non-load-bearing partitions
4. Framing for non-load-bearing exterior walls
5. Roof construction
6. Plywood backing panels

2.4 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent
- B. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of any species
- C. Framing Other Than Non-Load-Bearing Interior Partitions: No. 2 grade and any of the following species:
 1. Hem-fir (north); NLGA
 2. Douglas fir-larch; WCLIB or WWPA
 3. Spruce-pine-fir; NLGA
- D. Framing Other Than Non-Load-Bearing Interior Partitions: Any species and grade with a modulus of elasticity of at least 1,500,000 psi (10 350 MPa) and an extreme fiber stress in bending of at least 1000 psi (6.9 MPa) for 2-inch nominal (38-mm actual) thickness and 12-inch nominal (286-mm actual) width for single-member use.

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
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
 1. Mixed southern pine, No. 2 grade; SPIB
 2. Eastern softwoods, No. 2 Common grade; NeLMA
 3. Northern species, No. 2 Common grade; NLGA
 4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA

2.6 PLYWOOD SHEATHING

- A. Roof Sheathing: 3/4" APA CDX Plywood. C-D Exposure 1 with exterior glue.
- B. Plywood Nailers: APA CDX Plywood. C-D Exposure 1 with exterior glue. Thickness as shown on drawings.
- C. Plywood Subfloor: 3/4" APA CDX T&G Plywood. C-D Exposure 1 Tongue and Groove Edges.

2.7 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated

2.8 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified.
 - 1. Where rough 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.
- B. Power-Driven Fasteners: NES NER-272
- C. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers

2.9 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alpine Engineered Products, Inc.
 - 2. Cleveland Steel Specialty Co.
 - 3. Harlen Metal Products, Inc.
 - 4. KC Metals Products, Inc.
 - 5. Simpson Strong-Tie Co., Inc.
 - 6. Southeastern Metals Manufacturing Co., Inc.
 - 7. USP Structural Connectors
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

2.10 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit.

Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- E. Do not splice structural members between supports, unless otherwise indicated.
- F. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code
 - 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code
 - 4. Table 2305.2, "Fastening Schedule," in BOCA's BOCA National Building Code
 - 5. Table 2306.1, "Fastening Schedule," in SBCCI's Standard Building Code
 - 6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings
 - 7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's International One- and Two-Family Dwelling Code

3.2 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.

END OF SECTION 061000

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. Rooftop equipment bases and support curbs.
 - 2. Wood blocking, cants, and nailers.

- B. Related Sections:

- 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Division 07 Section "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.

1.3 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.

1.4 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. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.

- B. Maximum Moisture Content of Lumber: unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWP A U1; Category UC3b
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- 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 all miscellaneous carpentry unless otherwise indicated.

2.3 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. Substrate boards for roof or wall flashings.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.
- C. 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.
- D. 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.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where 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.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Where wood-preserved-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- 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.
- 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 (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
- H. 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.
- I. 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.

3.3 PROTECTION

- A. 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 079200 - JOINT SEALERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. The sealing of joints indicated on schedule at the end of this section.
2. The sealing of exterior joints, including:
 - a. Coping joints
 - b. Joints around perimeter of frames
3. The sealing of interior joints, including:
 - a. Wall joints
 - b. Joints around perimeter of frames
 - c. Joints between countertops and walls
4. The sealing of concealed joints in sound-retardant assemblies, including:
 - a. Around all electric outlet boxes, between top and bottom stud runners and structure, and where indicated
5. The sealing of joints in floors and pedestrian paving
6. The sealing of penetrations through exterior walls and roofs by pipes, ducts and conduit
7. The sealing of other joints indicated on drawings

B. Joints of a nature similar to that of joints indicated on the schedule shall be sealed with same sealer, whether indicated on drawings to be sealed or not.

C. Related Sections:

1. Firestopping/smokestopping sealers: Elsewhere in Division 7
2. Joint sealers in roofing work: Elsewhere in Division 7
3. Joint sealers in plumbing work: Division 22
3. Joint sealers in mechanical work: Division 23
4. Joint sealers in electrical work: Division 26

1.02 REFERENCES

- A. AAMA 800-92 -- Voluntary Specifications and Test Methods for Sealants; American Architectural Manufacturers Association; 1992.
- B. ASTM C 719-93 -- Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle); 1993.
- C. ASTM C 834-95 -- Standard Specification for Latex Sealants; 1995.

- D. ASTM C 919-84(88) -- Standard Practice for Use of Sealants in Acoustical Applications; 1984 (Reapproved 1988).
- E. ASTM C 920-95 -- Standard Specification for Elastomeric Joint Sealants; 1995.
- F. ASTM C 1193-91 -- Standard Guide for Use of Joint Sealants; 1991.
- G. ASTM D 2628-91 -- Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements; 1991.
- H. FS A-A-272 -- Caulking Compounds; 1980.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's data on each joint sealer, with instructions for substrate preparation and installation.
- B. Samples for Color Selection: Cured samples of actual products showing manufacturer's full range of colors (Products exposed to view only.)
- C. Samples for Color Verification: Cured samples of each color of each product used, prepared to simulate actual joints minimum 6 inches long; use substrates similar appearance to actual substrates. (Products exposed to view only.)
- D. Substrate Test Report for Each Sealer.
- E. Certified Product Test Reports: Independent testing agency reports showing compliance with all specified requirements.
 - 1. Reports may be on tests conducted up to 24 months before submission, provided the products tested were aged specimens of the same formulation as that to be used.
- F. Field Installation Test Reports.
- G. Certificates: For each sealer, provide manufacturer's certificate stating that the product complies with the specifications and is appropriate for the use it is being put to.
- H. Installer's Preconstruction Inspection Report: List all conditions detrimental to performance of joint sealer work.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Execution of at least 50 sealer installations of similar size and scope.
 - 2. Similar installations completed within 5 years before start of this project.
 - 3. Lead mechanic assigned from among those experienced on previous similar projects.
- B. Substrate Tests: Have samples of actual substrate materials tested by manufacturer(s) of sealer products.
 - 1. Test to determine what preparation procedures (if any are necessary to make sealers adhere properly under environmental conditions that may occur during installation.
 - 2. Test to determine compatibility with substrates backers, and secondary seals, if any.
 - 3. Use manufacturer's standard test methods.

4. Report the sealer manufacturer's recommendations for substrate preparation and sealer installation and identify specific primer(s) required.
 5. The requirement for testing for this project will be waived if test reports based on previous testing of the products and substrates to be used are acceptable to the architect.
- C. Field Installation Tests: Before installation, test the adhesion of all sealers to actual substrates.
1. Seal at least 5-foot lengths of joints and cure properly. Try to pull sealer out of joint by hand, by method recommended by sealer manufacturer.
 2. Select test joints representative of joints to be sealed by the product to be tested.
 3. Perform tests for each type of sealer.
 4. Do tests in the presence of the architect.
 5. Report acceptable results only.
- D. Mock-ups: Before beginning installation, install sealers in joints in actual construction as directed by the architect, to show color, materials, and installation. Keep mock-ups intact as the standard for evaluating the completed work.
- E. Preinstallation Meeting: Have the installer, sealer manufacturers' representatives, and other affected installers meet to review sealer installation and protection procedures and sequencing with other work.
- 1.05 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials in original containers or bundles with labels showing manufacturer, product name or designation, color, shelf life, and installation instructions.
- 1.06 PROJECT CONDITIONS
- A. Environmental Limitations: Do not install sealers if any of the following conditions exist:
1. Air or substrate temperatures exceed the range recommended by sealer manufacturer or is below 40 degrees F (4.4 degrees C).
 2. Substrate is wet, damp, or covered with snow, ice, or frost.
- B. Dimensional Limitations: Do not install sealers if joint dimensions are less than or greater than that recommended by sealer manufacturer; notify the architect and get sealer manufacturer's recommendations for alternative procedures.
- C. Coordination Data: Compression gasket manufacturer's requirements for joint dimensional tolerances; provide to installers of joints to be sealed with compression gaskets.
- 1.07 WARRANTY
- A. Submit written warranty signed by contractor and installer guaranteeing to correct failures in sealer work that occur within 5 years after substantial completion, without reducing or otherwise limiting any other rights to correction which the owner may have under the contract documents. Failure is defined as failure to remain weathertight due to faulty materials or workmanship. Correction is limited to replacement of sealers.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

- A. General: Provide only products which are recommended and approved by their manufacturer for the specific use to which they are put and which comply with all requirements of the contract documents.
1. For each generic product, use only materials from one manufacturer.
 2. Provide only materials, which are compatible with each other and with joint substrates.
 3. Colors of exposed sealers: As selected by the architect from manufacturer's standard colors.
- B. Manufacturers: Products of the manufacturers listed, provided they comply with requirements of the contract documents will be among those considered acceptable.
1. Polysulfide sealants:
 - a. A. C. Horn, Inc.
 - b. W. R. Meadows, Inc.
 - c. Pecora Corporation
 - d. Products Research & Chemical Corporation
 2. Silicone sealants:
 - a. Bostik Inc.
 - b. Dow Corning Corporation
 - c. Pecora Corporation
 - d. Tremco, Inc.
 - e. GE Silicones
 - f. Rhone-Poulenc, Inc.
 3. Urethane sealants:
 - a. Bostik Inc.
 - b. Mameco International, Inc.
 - c. Pecora Corporation.
 - d. Products Research & Chemical Corporation.
 - e. Sika Corporation.
 - f. Sonneborn Building Products Division/ChemRex, Inc.
 - g. Tremco, Inc.
 - h. W. R. Meadows, Inc.
 4. Acrylic solvent-release sealants:
 - a. Pecora Corporation
 - b. Koch Protective Treatments, Inc.
 - c. Tremco, Inc.
 5. Butyl sealants:
 - a. Pecora Corporation
 - b. Koch Protective Treatments, Inc.
 - c. Tremco, Inc.
 6. Acrylic-latex emulsion sealant:
 - a. Bostik Inc.

- b. Pecora Corporation
- c. Sonneborn Building Products Division/ChemRex, Inc.

2.02 ELASTOMERIC SEALANTS

- A. Elastomeric Sealants - General: Chemically curing elastomeric sealants of types indicated, complying with ASTM C 920, including specific Type, Grade, Class, and Uses indicated, as well as all other requirements specified.
 - 1. Where movement capability exceeding that measured by ASTM C 920 is specified, sealant shall withstand the total movement indicated while remaining in compliance with the other requirements specified, when tested in accordance with ASTM C 719, with base joint width measured at the time of application.
 - 2. For M-type substrates: Comply with requirements for Use M.
 - 3. For G-type substrates: Comply with requirements for Use G.
 - 4. For A-type substrates: Comply with requirements for Use A.
 - 5. For O-type substrates: Comply with requirements Use M (minimum) and Use O for the particular substrate.
- B. Two-Part Pourable Polysulfide Sealant: Type M, Grade P, Class 12-1/2, Use T.
- C. Polysulfide Sealant for Water Immersion: Type M, Grade NS, Class 12-1/2, Use T, specifically recommended by the manufacturer for sealing joints immersed continuously in water.
- D. One-Part Non-sag Polysulfide Sealant: Type S, Grade NS, Class 12-1/2, Use NT.
- E. High Movement Silicone Sealant: One- or two-part non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of at least 50 percent in both extension and compression.
- F. Medium Movement Silicone Sealant: One- or two-part non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of more than 25 percent but less than 50 percent in both extension and compression.
- G. High Strength Silicone Sealant: One-part, acid- or non-acid-curing, Type S, Grade NS, Class 25, Use NT; with not over plus or minus 30 percent movement capability.
- H. Mildew-Resistant Silicone Sealant: One-part, Type S, Grade NS, Class 25, Use NT, formulated with fungicide, for interior use on nonporous substrates.
- I. Silicone Sealant for Use T: One-part, non-acid curing, Type S, Grade NS, Class 25, Use T, Use M, plus movement capability of 50 percent in both extension and compression.
- J. All-Purpose Urethane Sealant: Multipart, non-sag, Type M, Grade NS, Class 25, Uses NT, M, G and A.
- K. Multipart Pourable Urethane Sealant: Type M, Grade P, Class 25, Use T.
- L. Non-sag Urethane Sealant for Use T: Type S or M, Grade NS, Class 25, Use T.
- M. One-Part Pourable Urethane Sealant: Type S, Grade P, Class 25, Use T.
- N. Urethane Sealant for Water Immersion: One- or two-part urethane, Grade NS, Class 25, Use NT, specifically recommended by the manufacturer for sealing joints immersed continuously in water.

2.03 SOLVENT-RELEASE-CURING SEALANTS

- A. Acrylic Sealant: Non-sag, one-part, solvent-release-curing; complying with ASTM C 920, Type S Grade NS, Use NT, with the following exceptions:
 - 1. Weight loss: 15 percent, maximum.
 - 2. Movement capability: 12-1/2 percent in both extension and compression, minimum.
- B. Butyl Sealant: Non-sag, one part, solvent-release-curing; complying with FS A-A-272, Type III; non-staining; paintable.

2.04 LATEX SEALANTS

- A. Acrylic-Latex Emulsion Sealant: One-part, non-sag, mildew-resistant, paintable; complying with ASTM C 834.

2.05 NON-CURING SEALERS

- A. Non-curing Butyl Sealant: Nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant.
- B. Butyl Polyisobutylene Sealant: Non-curing, nondrying, solvent-release; complying with 809.2, as described in AAMA 800.

2.06 COMPRESSION SEALS

- A. Compression Gaskets: Neoprene (polychloroprene) hollow gasket; complying with ASTM D 2628; sizes and shapes as indicated.
 - 1. Accordion Type
 - 2. Manufacturers:
 - a. The D. S. Brown Company.
 - b. Watson Bowman Acme Corp.

2.07 SEALANT BACKERS

- A. Backers - General: Non-staining; recommended or approved by sealant manufacturer for specific use.
- B. Backer Rods: Flexible, nonabsorbent, compressible polyurethane foam, either open-cell or non-gassing closed-cell, unless otherwise restricted by sealant manufacturer; preformed to appropriate size and shape.

2.08 MISCELLANEOUS MATERIALS

- A. Primers: Use primers determined to be required by substrate tests.
- B. Cleaners: As recommended by sealer manufacturer and not damaging to substrates.
- C. Masking Tape: Nonabsorbent, non-staining.
- D. Tooling Agents: Approved by sealant manufacturer; non-staining to sealant and substrate.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine joints for characteristics that may affect sealer performance, including configuration and dimensions.
- B. For compression gaskets, joints should have straight, parallel sides within proper tolerances, free of spalls.
- C. Do not begin joint sealer work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Cleaning: Just before starting sealer installation, clean out joints in accord with recommendations of sealer manufacturers and as follows:
 - 1. Remove all material that could impair adhesion, including dust, dirt, coatings, paint, oil, and grease. Exception: Materials tested to show acceptable adhesion and compatibility.
 - 2. Dry out damp and wet substrates thoroughly.
 - 3. Clean M-type and O-type substrates by suitable mechanical or chemical methods.
 - 4. Remove loose particles by vacuuming or by blowing with oil-free compressed air.
 - 5. Concrete: Remove laitance and form-release coatings.
 - 6. Clean A-type and G-type substrates by chemical or other methods, which will not damage the substrate.
 - 7. Use methods, which will not leave residues that will impair adhesion.
- B. Priming: Prime substrates as recommended by sealer manufacturer.
- C. Masking Tape: Use masking tape to keep primers and sealers off of adjacent surfaces, which would be damaged by contact or by cleanup. Remove tape as soon as practical.
- D. Install fillers where needed to provide proper joint depth or support for sealant backers.

3.03 INSTALLATION

- A. Comply with sealer manufacturers' instructions and recommendations, except where more restrictive requirements are specified.
- B. Gunnable and Pourable Sealants: Comply with recommendations of ASTM C 1193.
- C. Sealants in Acoustical Assemblies: Comply with recommendations of ASTM C 919.
- D. Backers:
 - 1. Install backers at depth required to result in shape and depth of installed sealant, which allows the most joint movement without failure.
 - a. Make backers continuous, without gaps, tears, or punctures.
 - b. Do not stretch or twist backers.
 - 2. If backers become wet or damp before installation of sealant, dry out thoroughly before proceeding.

- E. Sealants: Use methods recommended by manufacturer completely fill the joint; make full contact with bond surfaces; tool non-sag sealants to smooth surface eliminating air pockets.
 - 1. Use concave joint shape shown in Figure 5A in ASTM C 1193, where not otherwise indicated.

- F. Compression Gaskets: Use methods recommended by manufacturer; use as few end joints as possible; apply adhesive just before installing gaskets; make adhesively sealed joints at ends, corners, and intersections; install with top face approximately 1/8 to 1/4 inch below adjoining surfaces.

3.04 PROTECTION AND CLEANING

- A. Clean surfaces adjacent to joints as work progresses and before sealants set using methods and materials approved by manufacturers of sealers and of surfaces to be cleaned.
- B. Protect joint sealers from contamination and damage.
- C. Remove and replace damaged sealers.

3.05 SCHEDULE OF JOINT SEALERS

- A. General: Unless otherwise indicated, joints around perimeter of frames, where indicated to be sealed, are to be sealed using sealer specified for the substrate adjacent to the frame.
- B. Exterior Joints for Which No Other Sealer Is Indicated:
 - 1. Use one of the following sealants:
 - a. High movement silicone sealant
 - b. Medium movement silicone sealant
 - 2. Backer: Backer rod
 - 3. Joint shape: Concave joint configuration
- C. Interior Joints for Which No Other Sealer Is Indicated:
 - 1. Use one of the following sealants:
 - a. Acrylic-emulsion latex sealant
 - 2. Backer: Backer rod
 - 3. Joint shape: Concave joint configuration
- D. Below-Grade Joints:
 - 1. Use one of the following sealants:
 - a. Polysulfide sealant for water immersion
 - b. Urethane sealant for water immersion
 - 2. Backer: Backer rod
 - 3. Joint shape: Concave joint configuration
- E. Exterior Joints Well Protected from Weather and Not Subject to Movement:

1. Use one of the following sealants:
 - a. Acrylic sealant
 - b. Butyl sealant
 2. Backer: Backer rod
- F. Interior Floor Joints and Pedestrian Paving Joints, Less than 1-1/2 Percent Slope:
1. Use one of the following sealants:
 - a. Compression gasket
 - b. Two-part pourable polysulfide sealant
 - c. Silicone sealant for Use T
 - d. Two-part pourable urethane sealant
 - e. Two-part nonsag urethane sealant for Use T
 - f. One-part pourable urethane sealant
 2. Backer: Backer rod
 3. Joint shape: Concave joint configuration
- G. Joints around Pipes, Ducts, and Conduit Penetrating Exterior Walls and Roofs:
1. Use one of the following sealants:
 - a. Same as used for adjacent substrates
- H. Joints in Interior Wet Areas:
1. Use one of the following sealants:
 - a. Mildew-resistant silicone sealant
 2. Backer: Backer rod
 3. Joint shape: Concave joint configuration
- I. Concealed Joints in Acoustical Assemblies:
1. Use one of the following sealants:
 - a. Acrylic-emulsion latex sealant
 - b. Non-curing butyl sealant
 - c. Butyl polyisobutylene sealant

END OF SECTION 079200

SECTION 084313 – THERMALLY BROKEN ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Thermally broken aluminum-framed storefront systems.

1.2 RELATED SECTIONS

- A. Section 07900 (07 90 00) - Joint Sealers (Joint Protection).
- B. Section 08800 (08 80 00) - Glazing.

1.3 REFERENCES

- A. AAMA 1503-09 - Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- B. AAMA/NWWDA 101/I.S. 2 - Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
- C. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. ASTM D 1667 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed-Cell Form).
- E. ASTM D 2000 - Classification System for Rubber Products in Automotive Applications.
- F. ASTM D 6670-01 - Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products.
- G. ASTM E 283 - Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.
- H. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- I. ASTM E 331 - Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- J. ASTM F 588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

- A. General: Provide storefront systems that comply with specified design and performance requirements, based on testing of current products.
- B. Thermal Movement: Design storefront systems to provide for expansion and contraction of component materials.
- C. Performance Requirements: AAMA/NWWDA 101/I.S.2/A440-08 and -11
 - 1. Air Infiltration, ASTM E 283, 6.24 psf (50 mph): Less than 0.01 cfm/ft².
 - 2. Water Resistance, ASTM E 331: 15.0 psf.

3. Overall Design Pressure, ASTM E 330: 100.0 psf, positive and negative.
4. Structural Test Pressure, ASTM E 330: 150.0 psf, positive and negative.
5. Forced Entry Resistance, ASTM F 588: Grade 10.

D. Thermal Performance: Tested Product Size per NFRC 100

1. Condensation Resistance Factor (CRF), AAMA 1503: 77.
2. Thermal Transmittance U value, AAMA 1503: 0.33 Btu/hr-ft²-F.

E. Indoor air quality testing per ASTM D 6670-01: GREENGUARD Environmental Institute Certified including GREENGUARD for Children and Schools Certification.

1.5 SUBMITTALS

A. Comply with Section 013300 - Submittal Procedures.

B. Product Data: Submit manufacturer's product data, including description of materials, components, fabrication, finish, and installation.

C. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, framing, glazing, and finish.

D. Samples:

1. Submit manufacturer's samples of storefront systems showing framing, glazing, and finish.
2. Color: Submit manufacturer's samples of standard finishes for framing.

E. Test Reports: Submit test reports from qualified independent testing agency, indicating storefront systems comply with specified requirements, based on testing of current products.

F. Manufacturer's Project References: Submit list of successfully completed entrance system projects, including project name and location, name of architect, and type and quantity of entrance systems installed.

G. Maintenance Manual: Submit manufacturer's maintenance and cleaning instructions for storefront systems.

H. Warranty: Submit manufacturer's standard warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years successful experience.
2. Door and frame components from same manufacturer.
3. Evidence of a compliant documented quality management system.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying model and manufacturer.

B. Storage:

1. Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
 2. Stack framing members to prevent bending and other damage.
- C. Handling: Protect materials and finish from damage during handling and installation.
- 1.8 WARRANTY
- A. Warrant framing against failure in materials and workmanship, including excessive deflection and deterioration of finish or construction in excess of normal weathering.
- B. Warranty Period: Ten years starting on date of shipment.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Special-Lite, Inc., PO Box 6, Decatur, Michigan 49045. Toll Free (800) 821-6531. Phone (269) 423-7068. Fax (800) 423-7610. Web Site www.special-lite.com. E-Mail info@special-lite.com.

2.2 ALUMINUM-FRAMED STOREFRONT SYSTEMS

- A. Model: SL-600TB aluminum-framed storefront system.
- B. Framing:
1. Size: 2 inches by 6 inches, thermally broken.
 2. Material: Aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T6 alloy recovered from industrial processes, ASTM B 221.
 3. Jambs, Mullions, Sills, Horizontal Intermediates, and Headers: 0.080-inch wall thickness.
 4. Lock Jambs, Hinge Jambs, and Door Headers: 0.125-inch wall thickness.
- C. Thermal Break: Fiberglass pultrusion thermal strut and pocket filler.
- D. Doors: As specified in Section 081743.
- E. Fasteners:
1. Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.
 2. Compatibility: Compatible with items to be fastened.
 3. Exposed Fasteners: Screws with finish matching items to be fastened.
- F. Glazing Gaskets: Gaskets installed in captive assembly of glazing stops.
1. EPDM: ASTM D 2000.
 2. Closed-Cell Foam: ASTM D 1667.

2.3 FRAMING CONSTRUCTION

- A. Thermally Broken Storefront Framing:
1. Size and Type: As indicated on the Drawings.
 2. Material: Aluminum extrusions made from prime-equivalent billet that is produced from

- 100% reprocessed 6063-T6 alloy recovered from industrial processes. Fiberglass pultruded thermal strut 2" wide by 3/16" thick.
3. Perimeter Frame Members:
 - a. Storefront frame with thermally broken pocket filler.
 - b. Factory fabricated by frame manufacturer.
 - c. Open-back framing is not acceptable.
 4. Applied Door Stops:
 - a. 0.625-inch high, with screws and weather stripping.
 - b. Pressure gasketing for weathering seal.
 - c. Counterpunch fastener holes in door stop to preserve full-metal thickness under fastener head.
 - d. Minimum 1/2" aluminum bar reinforcement under doorstop for required hardware attachments.
 5. Caulking: Caulk joints before assembling frame members.
 6. Joints:
 - a. Secure joints with fasteners.
 - b. Provide hairline butt joint appearance.
 - c. Shear block construction only, no screw spline allowed.
 7. Hardware:
 - a. Premachine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
 - b. Factory install door hardware.
 8. Anchors:
 - a. Anchors appropriate for wall conditions to anchor framing to wall materials.
 - b. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
 - c. Secure head and sill members of transom, side lites, and similar conditions.

2.4 FABRICATION

- A. Sizes and Profiles: Required sizes for frame units and profile requirements shall be as specified and as indicated on the Drawings.
- B. Coordination of Fabrication: Field measure before fabrication and show recorded measurements on shop drawings.
- C. Assembly: Assembly of thermally broken frame must be completed by manufacturer at factory and ship assembled to its fullest possible extent.
 1. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
 2. Remove burrs from cut edges.
- D. Welding: Welding of framing is not acceptable.
- E. Fit:
 1. Maintain continuity of line and accurate relation of planes and angles.
 2. Secure attachments and support at mechanical joints with hairline fit at contacting members.
- F. Fasteners: Conceal fasteners wherever possible.
- G. Sealant: Silicone sealant as specified in Section 079000.

2.5 GLAZING

- A. Design glazing system for replacement of glass.

- B. Manufacturer's standard flush glazing system of recessed channels and captive glazing gaskets or applied stops as indicated on the Drawings.
- C. Allow for thermal expansion on exterior units.
- D. Water diverter to fit into glazing pocket.

2.6 ALUMINUM FINISHES

- A. Anodized Finish:
 - 1. Dark Bronze, AA-M10C12C22A44.
 - a. Class: I.
 - b. Thickness: 0.7 mils.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive storefront systems. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Ensure openings to receive storefront systems are plumb, level, square, and in tolerance.

3.3 INSTALLATION

- A. Install storefront systems in accordance with manufacturer's instructions.
- B. Install storefront systems plumb, level, square, true to line, and weathertight, without warp or rack.
- C. Install doors as specified in Section 081743.
- D. Anchor framing securely in place.
- E. Tolerances: Install storefront systems in accordance with following tolerances:
 - 1. Variation from Plane: Do not exceed 1/8 inch in 12 feet of length or 1/4 inch in any total length.
 - 2. Offset from Alignment: Maximum offset from true alignment between 2 identical members abutting end to end in line shall not exceed 1/16 inch.
 - 3. Diagonal Measurements: Maximum difference in diagonal measurements shall not exceed 1/8 inch.
 - 4. Offset at Corners: Maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.
- F. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.
- G. Set sills, door thresholds, and other members in bed of sealant or with joint fillers or gaskets

to provide weathertight construction. Comply with Section 079000.

- H. Install sill flashing to make frame watertight at sill.
- I. Glass: Install glass indicated to be glazed into framing, and not preglazed, as specified in Section 088000.
- J. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- K. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 CLEANING

- A. Clean storefront systems promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage glazing or finish.

3.5 PROTECTION

- A. Protect installed storefront systems to ensure that, except for normal weathering, storefront systems will be without damage or deterioration at time of substantial completion.

END OF SECTION 084313

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Exterior gypsum board for ceilings and soffits.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry"

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
 - 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.04 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.05 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.

1.06 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, 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, those that are moisture damaged, and those that are 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

2.01 PERFORMANCE REQUIREMENTS

- A. Moisture- and Mold-Resistant Assemblies: Provide and install moisture- and mold-resistant glass-mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C 1658 and ASTM C 1177 where indicated on Drawings and in all locations which might be subject to moisture exposure during construction. 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.
- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- D. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.02 GYPSUM BOARD, GENERAL

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
- B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.03 INTERIOR GYPSUM BOARD

- A. Basis-of-Design Product: The design for each type of gypsum board and related products is based on Georgia-Pacific Gypsum products named. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. American Gypsum.
 2. CertainTeed Corp.
 3. Lafarge North America Inc.
 4. National Gypsum Company.
 5. PABCO Gypsum.
 6. Temple-Inland.
 7. USG Corporation.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
1. Basis-of-Design Product: Georgia-Pacific Gypsum; DensArmor Plus High-Performance Interior Panel.
 2. Thickness: 1/2 inch.
 3. Long Edges: Tapered.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Basis-of-Design Product: Georgia-Pacific Gypsum; **DensArmor Plus Fireguard High-Performance Interior Panel**.
 2. Thickness: 5/8 inch.
 3. Long Edges: Tapered.
- D. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, **[Level 1] [Level 2] [Level 3]**.
1. Basis-of-Design Product: Georgia-Pacific Gypsum; "[**DensArmor Plus Abuse-Resistant Panel**] [**ToughRock Abuse-Guard Gypsum Board**]".
 2. Thickness: 5/8 inch.
 3. Long Edges: Tapered.
- E. Impact-Resistant Gypsum Board: ASTM C 1629/C 1629M.
1. Basis-of-Design Product: Georgia-Pacific Gypsum; "DensArmor Plus Impact-Resistant Panel".
 2. Thickness: 5/8 inch.
 3. Long Edges: Tapered.
 4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.04 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.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

- 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. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
- 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
- 3. Finish: **Corrosion-resistant primer compatible with joint compound and finish materials specified.**

2.05 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

- 1. Interior Gypsum Board: Paper.
- 2. Exterior Gypsum Soffit Board: Paper.
- 3. Exterior Glass Mat Gypsum Soffit: Fiberglass mesh.
- 4. Glass-Mat Gypsum Wallboard: 10-by-10 fiberglass mesh.
- 5. Glass-Mat Gypsum Sheathing Board: 10-by-10 fiberglass mesh.
- 6. 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.
 - a. Basis-of-Design Product: Georgia-Pacific Gypsum; ToughRock Setting Compound or ToughRock Sandable Setting Compound.
- 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.
 - a. Basis-of-Design Product: Georgia-Pacific Gypsum; ToughRock Setting Compound, ToughRock Sandable Setting Compound, ToughRock Ready Mix All-Purpose Joint Compound.
 - b. Use setting-type compound for installing paper-faced metal trim accessories.
- 3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.

- a. Basis-of-Design Product: Georgia-Pacific Gypsum; ToughRock Setting Compound, ToughRock Sandable Setting Compound, ToughRock Ready Mix All-Purpose Joint Compound, ToughRock Ready Mix Topping Joint Compound.
- 4. Finish Coat: For third coat, use setting-type, sandable topping or drying-type, all-purpose compound.
 - a. Basis-of-Design Product: Georgia-Pacific Gypsum; ToughRock Setting Compound, ToughRock Sandable Setting Compound, ToughRock Ready Mix All-Purpose Joint Compound, ToughRock Ready Mix Topping Joint Compound.
- 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound, drying-type, all-purpose compound, high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
 - a. Basis-of-Design Product: Georgia-Pacific Gypsum; ToughRock Setting Compound, ToughRock Sandable Setting Compound, ToughRock Ready Mix All-Purpose Joint Compound, ToughRock Ready Mix Topping Joint Compound.

2.06 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Laminating 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. Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 - 2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
- E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

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. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
 - b. Grabber Construction Products; Acoustical Sealant GSC.
 - c. Pecora Corporation; [AC-20 FTR] [AIS-919].
 - d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - e. USG Corporation; SHEETROCK Acoustical Sealant.
2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- 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.

3.02 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, except floors. 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. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.03 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. Abuse-Resistant Type: As indicated on Drawings.
 4. Impact-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) 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-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 base 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-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.

3.04 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 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 unless otherwise indicated.
 2. Bullnose Bead: Use at outside corners.
 3. LC-Bead: Use at exposed panel edges.
 4. L-Bead: Use where indicated.
 5. U-Bead: Use at exposed panel edges.

3.05 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.
 3. Level 3: Where indicated on Drawings.
 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
 5. Level 5: Where indicated on Drawings.

- a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.06 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 099113 – EXTERIOR PAINTING

PART 1 - GENERAL

1.01 SECTION INCLUDES: (See Paint Schedule and finish designations)

- A. Painting interior

1.02 RELATED SECTIONS: (including but not limited to)

- A. Section 033000, Cast-In-Place Concrete
- B. Section 042200, Unit Masonry
- D. Section 092900, Gypsum Board Assemblies

1.03 DEFINITIONS

- A. "Paint or Painting" as used in this specification, are in a general sense and include: Sealers, primers, stains; oil, alkyd, latex, epoxy, and enamel type paints; lacquers; fillers; and the application of these materials.

1.04 PRODUCT SUBMITTALS

- A. Product Data: Listing of proposed products matched to specified products. Cut sheet for each product indicating generic formulation, sheen, ingredients, percentage by volume, and breakdown of pigment versus vehicle.
- B. Samples: Full range of custom mixed color chips for selection.

1.05 CONTRACT CLOSEOUT SUBMITTALS

- A. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.06 PACKING AND DELIVERY

- A. Delivery: Unopened containers with manufacturer's labels indicating type of paint, stock number, color number and instructions.

1.07 STORAGE AND PROTECTION

- A. Storage: Do not store volatiles, thinners, and solvents (including rags and tool cleaning pails) within the building.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Temperature:
 - 1. Interior: Constant 65 degrees F. or above. Prevent wide variations in temperature which might result in condensation.
 - 2. Exterior: Do not paint materials when temperature is below 50 degrees F.
- B. Avoid painting any surfaces while they are exposed to hot sun.
- C. Provide proper conditions of ventilation and light; use artificial light in quantity equivalent to normal occupancy lighting.

PART 2 - PRODUCTS

2.01 PAINT AND FINISHES

- A. Manufacturer:
 - 1. Pratt & Lambert, Inc.
 - 2. PPG Industries
 - 3. M.A. Bruder & Sons, Inc.
 - 4. Sherwin Williams (Product #s specified)
 - 5. ICI Glidden
 - 6. Benjamin Moore Paint Co.
 - 7. Duron Paints & Wallcoverings
- B. Specific products are indicated in painting schedule included at the end of this Section. These products establish a standard of quality. Others may be required to substantiate properties and qualities.
- C. Ready-mixed; well ground, not settle badly, cake or thicken in the container, readily broken up with a paddle to a smooth consistency; and having easy brushing properties; Lead free.
- D. Colors: Standard colors.
 - 1. Eight (8) eggshell colors for walls throughout.
 - 2. Four (4) semi-gloss colors for closet shelving.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Inspection and Surfaces:
 - 1. Carefully examine executed work of other trades which might affect this Work.
 - 2. Commencement of priming of surfaces constitutes acceptance by Contractor that surface meets finish and manufacturers requirements.
- B. Protect materials and equipment from damage by painting and finishing.

1. Tape, mask, cover and/or coat adjacent materials, areas, surfaces, and equipment not to receive finishes noted in this Section. Specifically protect wood floors and natural unfinished wood.
2. Before painting, remove hardware, accessories, plates and similar items or provide ample protection of such items.
3. Remove doors, if necessary, to paint bottom edge.
4. Use only skilled mechanics for removing and replacing such items. Upon completion of each space replace above items.

C. General Preparation of Surfaces:

1. Prepare all surfaces in accordance with manufacturer's recommendations for product being used.
2. Surfaces: Clean; dry; free of moisture and dampness; smooth, even, true to plane; and free of material which will adversely affect adhesion or appearance of applied coating.

3.03 PREPARATION- METAL SURFACES TO BE PAINTED

- A. Thoroughly clean metal surfaces where rust or scale is present, by the use of wire brushing and/or abrasive paper.
- B. Wash surfaces with mineral spirits to remove any grease, oil or dirt.
- C. Touch-up all shop primed or coated surfaces chipped or abraded, using shop coat material specified. Feather edges of damaged shop coat to achieve smooth finish. Comply with metal preparation as indicated by the manufacturer of the coating.

3.04 PREPARATION- MASONRY SURFACES

- A. Masonry Surfaces: Allow to cure at least thirty (30) days before painting. Before apply the first coat of paint, fill all joints and point up all holes, Correct any imperfections. Remove all mortar or plaster droppings and any other foreign matter. Brush surfaces with a stiff bristle or wire brush.
- B. Neutralize free lime with a solution acceptable to the manufacturers of the paint which is to be applied.

3.05 PREPARATION- CONCRETE SURFACES

- A. Patch openings, voids, holes, cracks, and irregularities with Portland Cement mortar and finish flush with adjacent surfaces.
- B. Remove contaminants, oil, scum, grease, and the like.
- C. Remove all loose, powdery or dusting surface laitance mechanically (scarification).
- D. Remove form oil from concrete as recommended by paint manufacturer for proper adhesion.
- E. Allow surfaces to dry completely, usually 60 to 90 days of moderate, weather, before painting.

3.07 APPLICATION OF PAINTS

- A. General Requirements: Comply with manufacturer's instructions including environmental conditions, temperatures, pot life, drying and recoating times. Utilize tools and equipment recommended for products.
1. Do not apply coating until moisture content of surface is within limitations recommended by the paint manufacturer. Test with moisture meter. Submit results to Architect at close of each day.
 2. Apply paint, enamel, stains and varnishes with suitable brushes, rollers or spray equipment which have been kept clean, free from contamination and suitable for finish required.
 3. Rate of application of coating shall not exceed that as recommended by the paint manufacturer for the purpose of surface involved.
 4. Sand and dust between each coat to remove visible defects and blemishes.
- B. Coverage:
1. Apply not less than 2 separate and distinct coats of finish on all exposed Work throughout.
 2. Apply to shop or factory primed surfaces not less than 1 finish coat; in addition to the prime coat.
 3. Apply additional coats should there be a deficiency in coverage.
 4. Apply additional coats over entire surface until paint film is of uniform finish, color appearance and coverage, specifically when previous color, stain, dirt, spackle, patching or undercoats show through final coats.
 5. If problems arise in connection with application of paint, stop painting area immediately and contact paint manufacturer for recommendation.
- C. Methods of Application:
1. Brush Application: Brush each coat out uniformly to eliminate laps, skips and excess brush marks. Brush apply field coats on metals, and trim.
 2. Roller Application: Use proper skill to avoid signs of lapping and excess paint lines from edge of roller. When cutting in with a brush is required, these areas must be of same texture, color and hiding as adjacent areas, to ensure good appearance.
 3. Spray Application: Absolute masking and protective measures shall be taken to avoid damage to other finish materials. Manufacturer's recommendations for dry mil thickness are minimums and square feet per gallon shall not be exceeded. Paints shall not be diluted for purpose of spraying.
- D. Drying:
1. Do not apply any type finish until the preceding coats are thoroughly dry and hard.
 2. Interior Paint: Allow to dry at least 24 hours between coats.
 3. Exterior Paint: Allow to dry at least 48 hours between coats.
- E. Appearance: (As visible from 3 feet)
1. Smooth and even; free from runs, sags, skips, streaks and holidays.
 2. No variation in sheen or color within continuous surfaces.
 3. No clogging of lines and angles of shapes and details.

4. Edges (adjoining other materials or other colors): Paint sharp and clean without overlapping.
5. Coats: Proper consistency and well spread so as to show no laps and brush marks.

3.08 REPAIR AND CORRECTION

- A. Repair damage (resulting from painting) done to the Work of others and existing Work.
- B. Correct Work damage caused by drafty, dusty conditions or cold, to complete satisfaction, without additional cost.
- C. Refinish entire surface where portion of finish has been damaged or is not acceptable.
- D. No claims will be allowed for correction of defective Work caused by failure to adequately prepare substrates and abide by manufacturers recommendations.

3.09 CLEANING

- A. Touch-up and restore where finish is damaged.
- B. Remove spilled, splashed or splattered paint from all surfaces.
- C. Do not mar surface finish of item being cleaned.
- D. Leave storage spaces clean and in condition required for equivalent spaces in project. Leave premises clean and free from all rubbish and accumulated material left from this Work.

3.10 SCHEDULE - INTERIOR SURFACES (NORMAL EXPOSURE)

- A. MASONRY - (Walls & Ceilings, Concrete, Cement Board)
 1. Latex Systems:
 - a. Semi-Gloss Finish:
 - 1st Coat: S-W ProMar 200 Zero VOC Latex Primer (4 mils wet, 1.0 mils dry)
 - 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss B30-2600 Series
 - 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss B30-2600 Series (4 mils wet, 1.6 mils dry per coat.)
- B. MASONRY - (CMU - Concrete or Concrete Masonry Units)
 1. Latex Systems:
 - a. Semi-Gloss Finish:
 - 1st Coat: S-W PrepRite Interior/Exterior Block Filler B25W25 (75-125 sq.ft./gal.)
 - 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss B30-2600 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss B30-2600 Series (4 mils wet, 1.6 mils dry per coat.)

b. Flat Finish:

1st Coat: S-W PrepRite Interior/Exterior Block Filler B25W25 (75-125 sq.ft./gal.)

2nd Coat: S-W ProMar 200 Zero VOC Latex Flat B30-2600 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Flat B30-2600 Series (4 mils wet, 1.6 mils dry per coat)

D. METAL - (Aluminum)

1. Latex Systems:

a. Semi-Gloss Finish:

1st Coat: Pro Industrial Pro-Cryl Universal Primer B66-310 Series @ 2.0-4.0 mils dry

2nd Coat: S-W Pro Industrial Acrylic Semi-Gloss B66-650 Series

3rd Coat: S-W Pro Industrial Acrylic Semi-Gloss B66-650 Series (4-12 mils wet, 2.5-4 mils dry per coat)

E. METAL - (Galvanized)

1. Latex Systems:

a. Semi-Gloss Finish:

1st Coat: 1Pro Industrial Pro-Cryl Universal Primer B66-310 Series @ 2.0-4.0 mils dry

2nd Coat: S-W Pro Industrial Acrylic Semi-Gloss B66-650 Series

3rd Coat: S-W Pro Industrial Acrylic Semi-Gloss B66-650 Series (6-12 mils wet, 2.5-4 mils dry per coat)

b. Eg-Shel Finish:

1st Coat: 1Pro Industrial Pro-Cryl Universal Primer B66-310 Series @ 2.0-4.0 mils dry

2nd Coat: S-W Pro Industrial Acrylic Eg-Shel B66-660 Series

3rd Coat: S-W Pro Industrial Acrylic Eg-Shel B66-660 Series (6-12 mils wet, 2.5-4 mils dry per coat)

Note: This finish product is self-priming on aluminum and galvanized surfaces. If primer is desired use:

F. METAL - Miscellaneous & Ornamental Iron, Sashes, Doors, Copper, Non-Galvanized Metal

1. Latex Systems:

a. Gloss Finish:

1st Coat: Pro Industrial Pro-Cryl Universal Primer B66-310 Series (5-10 mils wet, -4 mils dry)

2nd Coat: Pro Industrial Acrylic Gloss B66-610 Series

3rd Coat: Pro Industrial Acrylic Gloss B66-610 Series (6-12 mils wet, 2.5-4 mils dry per coat)

- b. Semi-Gloss Finish:
 - 1st Coat: Pro Industrial Pro-Cryl Universal Primer B66-310 Series (5-10 mils wet, 2-4 mils dry)
 - 2nd Coat: S-W Pro Industrial Acrylic Semi-Gloss B66-650 Series
 - 3rd Coat: S-W Pro Industrial Acrylic Semi-Gloss B66-650 Series (6-12 mils wet, 2.5-4 mils dry per coat)

- c. Eg-Shel Finish:
 - 1st Coat: Pro Industrial Pro-Cryl Universal Primer B66-310 Series (5-10 mils wet, 2-4 mils dry)
 - 2nd Coat: S-W Pro Industrial Acrylic Eg-Shel B66-660 Series
 - 3rd Coat: S-W Pro Industrial Acrylic Eg-Shel B66-660 Series (6-12 mils wet, 2.5-4 mils dry per coat)

END OF SECTION 099113

SECTION 099123 – INTERIOR PAINTING

PART 1 - GENERAL

1.01 SECTION INCLUDES: (See Paint Schedule and finish designations)

- A. Interior painting where required at disturbed finishes, to match existing.

1.02 DEFINITIONS

- A. "Paint or Painting" as used in this specification, are in a general sense and include: Sealers, primers, stains; oil, alkyd, latex, epoxy, and enamel type paints; lacquers; fillers; and the application of these materials.

1.03 PRODUCT SUBMITTALS

- A. Product Data: Listing of proposed products matched to specified products. Cut sheet for each product indicating generic formulation, sheen, ingredients, percentage by volume, and breakdown of pigment versus vehicle.
- B. Samples: Full range of custom mixed color chips for selection.

1.04 CONTRACT CLOSEOUT SUBMITTALS

- A. Maintenance Materials: Turn over to Owner upon completion; one gallon of each type and color of finish. Include color pigmentation formulation.

1.05 PACKING AND DELIVERY

- A. Delivery: Unopened containers with manufacturer's labels indicating type of paint, stock number, color number and instructions.

1.06 STORAGE AND PROTECTION

- A. Storage: Do not store volatiles, thinners, and solvents (including rags and tool cleaning pails) within the building.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Temperature:
 - 1. Interior: Constant 65 degrees F. or above. Prevent wide variations in temperature which might result in condensation.
- B. Avoid painting any surfaces while they are exposed to hot sun.
- C. Provide proper conditions of ventilation and light; use artificial light in quantity equivalent to normal occupancy lighting.

PART 2 - PRODUCTS

2.01 PAINT AND FINISHES

- A. Manufacturer:
Benjamin Moore Paint Co. (Product #s specified on Drawings)

Sherwin Williams (Product #s specified in Specification)
Pratt & Lambert, Inc.
ICI Glidden
M.A. Bruder & Sons, Inc.
Duron Paints & Wallcoverings
PPG Industries

- B. Specific products are indicated in painting schedule included at the end of this Section. These products establish a standard of quality. Others may be required to substantiate properties and qualities.
- C. Ready-mixed; well ground, not settle badly, cake or thicken in the container, readily broken up with a paddle to a smooth consistency; and having easy brushing properties; Lead free.
- D. Colors: Standard colors.
 - 1. Refer to Pain Schedule or Colors selected by owner following bid

PART 3 - EXECUTION

3.01 PREPARATION

- A. Inspection and Surfaces:
 - 1. Carefully examine executed work of other trades which might affect this work.
- B. Protect materials and equipment from damage by painting and finishing.
 - 1. Tape, mask, cover and/or coat adjacent materials, areas, surfaces, and equipment not to receive finishes noted in this Section. Specifically protect wood floors and natural unfinished wood.
 - 2. Before painting, remove hardware, accessories, plates and similar items or provide ample protection of such items.
 - 3. Remove doors, if necessary, to paint bottom edge.
 - 4. Use only skilled mechanics for removing and replacing such items. Upon completion of each space, replace above items.
- C. General Preparation of Surfaces:
 - 1. Prepare all surfaces in accordance with manufacturer's recommendations for product being used.
 - 2. Surfaces: Clean; dry; free of moisture and dampness; smooth, even, true to plane; and free of material which will adversely affect adhesion or appearance of applied coating.

3.02 PREPARATION- WOOD SURFACES TO BE PAINTED OR FINISHED

- A. Dry, clean, and free from oil, grease, wax, loose dirt or other foreign matter.
- B. Sand surfaces smooth and even, and then dust off before applying the first coat.
- C. Coat knots, sap streaks, and pitch spots with recommended sealer.
- D. Fill nail holes, cracks, and imperfections.

1. Paint Finish: Use wood putty.
 2. Natural or Stain Finish: Use plastic wood filler (match for specie and finish color).
- E. Apply paste wood filler on open grain wood. Wipe across the grain; then with a circular motion to secure a smooth, filled, clean surface with filler remaining in open grain only. After overnight dry, sand surface until smooth.

3.03 PREPARATION- METAL SURFACES TO BE PAINTED

- A. Thoroughly clean metal surfaces where rust or scale is present, by the use of wire brushing and/or abrasive paper.
- B. Wash surfaces with mineral spirits to remove any grease, oil or dirt.
- C. Touch-up all shop primed or coated surfaces chipped or abraded, using shop coat material specified. Feather edges of damaged shop coat to achieve smooth finish. Comply with metal preparation as indicated by the manufacturer of the coating.

3.04 PREPARATION- MASONRY SURFACES

- A. Masonry Surfaces: Allow to cure at least thirty (30) days before painting. Before apply the first coat of paint, fill all joints and point up all holes. Correct any imperfections. Remove all mortar or plaster droppings and any other foreign matter. Brush surfaces with a stiff bristle or wire brush.
- B. Neutralize free lime with a solution acceptable to the manufacturers of the paint which is to be applied.

3.05 PREPARATION - CONCRETE SURFACES

- A. Patch openings, voids, holes, cracks, and irregularities with Portland Cement mortar and finish flush with adjacent surfaces.
- B. Remove contaminants, oil, scum, grease, and the like.
- C. Remove all loose, powdery or dusty surface laitance mechanically (scarification).
- D. Remove form oil from concrete as recommended by paint manufacturer for proper adhesion.
- E. Allow surfaces to dry completely, usually 60 to 90 days of moderate, weather, before painting.

3.06 PREPARATION- GYPSUM BOARD SURFACES

- A. Fill all minor irregularities with spackling compound and sand to smooth, level surfaces. Exercise care to avoid raising nap of paper.
- B. Allow to cure at least 15 days before painting.
- C. Do not use sandpaper on paper surfaces to be painted.
- D. Do not apply paint or sealer when moisture content exceeds that required by paint manufacturer.

3.07 APPLICATION OF PAINTS

- A. General Requirements: Comply with manufacturer's instructions including environmental conditions, temperatures, pot life, drying and recoating times. Utilize tools and equipment recommended for products.
1. Do not apply coating until moisture content of surface is within limitations recommended by the paint manufacturer. Test with moisture meter.
 2. Apply paint, enamel, stains and varnishes with suitable brushes, rollers or spray equipment which have been kept clean, free from contamination and suitable for finish required.
 3. Rate of application of coating shall not exceed that as recommended by the paint manufacturer for the purpose of surface involved.
 4. Sand and dust between each coat to remove visible defects and blemishes.
- B. Coverage:
1. Apply not less than 2 separate and distinct coats of finish on all exposed Work throughout.
 2. Apply to shop or factory primed surfaces not less than 1 finish coat; in addition to the prime coat.
 3. Apply additional coats should there be a deficiency in coverage.
 4. Apply additional coats over entire surface until paint film is of uniform finish, color appearance and coverage, specifically when previous color, stain, dirt, spackle, patching or undercoats show through final coats.
 5. If problems arise in connection with application of paint, stop painting area immediately and contact paint manufacturer for recommendation.
- C. Methods of Application:
1. Brush Application: Brush each coat out uniformly to eliminate laps, skips and excess brush marks. Brush apply field coats on metals, and trim.
 2. Roller Application: Use proper skill to avoid signs of lapping and excess paint lines from edge of roller. When cutting in with a brush is required, these areas must be of same texture, color and hiding as adjacent areas, to ensure good appearance.
 3. Spray Application: Absolute masking and protective measures shall be taken to avoid damage to other finish materials. Manufacturer's recommendations for dry mil thickness are minimums and square feet per gallon shall not be exceeded. Paints shall not be diluted for purpose of spraying.
- D. Drying:
1. Do not apply any type finish until the preceding coats are thoroughly dry and hard.
 2. Interior Paint: Allow to dry at least 24 hours between coats.
 3. Exterior Paint: Allow to dry at least 48 hours between coats.
- E. Appearance: (As visible from 3 feet)

1. Smooth and even; free from runs, sags, skips, streaks and holidays.
2. No variation in sheen or color within continuous surfaces.
3. No clogging of lines and angles of shapes and details.
4. Edges (adjoining other materials or other colors): Paint sharp and clean without overlapping.
5. Coats: Proper consistency and well spread so as to show no laps and brush marks.

3.08 REPAIR AND CORRECTION

- A. Repair damage (resulting from painting) done to the Work of others and existing Work.
- B. Correct Work damage caused by drafty, dusty conditions or cold, to complete satisfaction, without additional cost.
- C. Refinish entire surface where portion of finish has been damaged or is not acceptable.
- D. No claims will be allowed for correction of defective Work caused by failure to adequately prepare substrates and abide by manufacturers recommendations.

3.09 CLEANING

- A. Touch-up and restore where finish is damaged.
- B. Remove spilled, splashed or splattered paint from all surfaces.
- C. Do not mar surface finish of item being cleaned.
- D. Leave storage spaces clean and in condition required for equivalent spaces in project. Leave premises clean and free from all rubbish and accumulated material left from this Work.

PART 4 - SCHEDULE - INTERIOR SURFACES (NORMAL EXPOSURE)

4.01 SCHEDULE

A. MASONRY - (Walls & Ceilings, Concrete, Cement Board)

1. Latex Systems:

a. Semi-Gloss Finish:

1st Coat: S-W Loxon Concrete & Masonry Primer A24W08300 (5.3 wet, 2.1 dry)
 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss Enamel, B31W02651
 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss Enamel, B31W02651
 (4 mils wet, 1.5 mils dry per coat)

B. MASONRY - (CMU - Concrete or Cinder Block)

1. Latex Systems:

a. Semi-Gloss Finish:

1st Coat: S-W ProMar Interior/Exterior Block Filler B25W00035
 (75-125 sq.ft./gal.)
 2nd Coat: S-W ProMar Zero VOC 200 Latex Semi-Gloss B31W02651 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss B31W02651 Series
(4 mils wet, 1.5 mils dry per coat)

b. Flat Finish:

1st Coat: S-W ProMar Interior/Exterior Block Filler B25W00035
(75-125 sq.ft./gal.)

2nd Coat: S-W ProMar 200 Zero VOC Latex Flat Wall Paint B3OW12650

3rd Coat: S-W ProMar 200 Zero VOC Latex Flat Wall Paint B3OW12650
(4 mils wet, 1.4 mils dry per coat)

2. Epoxy Systems: Field House Locker Rooms/Bathrooms

1st Coat: S-W Loxon Concrete Masonry Primer (1 coat)

2nd Coat: S-W Pro Industrial Pre-Catalyzed Epoxy (2 coats) K46-150 Series (Semi-Gloss)
K45-150 (Egg-Shell)

Recommended Spread Rate per Coat: 4 mils wet; 1.5 mils dry

C. CONCRETE - (Floors)

1. Alkyd Systems:

a. Gloss Finish:

1st Coat: S-W Industrial Enamel, B54Z Series

2nd Coat: S-W Industrial Enamel, B54Z Series
(4 mils wet, 2 mils dry per coat)

D. METAL - (Aluminum)

1. Latex Systems:

a. Semi-Gloss Finish:

1st Coat: S-W Pro Industrial Pro Cryl Universal Primer B66-1310 (5.0 wet, 2.0 dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss B31W02651 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss B31W02651 Series
(4 mils wet, 1.5 mils dry per coat)

E. METAL - (Galvanized)

1. Latex Systems:

a. Semi-Gloss Finish:

1st Coat: S-W Pro Industrial Pro Cryl Universal Primer B66-1310 (5.0 wet, 2.0 dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss B31W02651 Series

2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss B31W02651 Series
(4 mils wet, 1.3 mils dry per coat)

b. Flat Finish:

1st Coat: S-W ProMar 200 Zero VOC Latex Flat Wall Paint, B3OW12650

2nd Coat: S-W ProMar 200 Zero VOC Latex Flat Wall Paint, B3OW12650
(4 mils wet, 1.4 mils dry per coat)

F. METAL - Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous & Ornamental Iron, Sashes, Doors, Partitions, Cabinets, Lockers, Fixtures, Equipment, Copper, Non-Galvanized Metal

1. Latex Systems:

a. Gloss Finish:

1st Coat: 1st Coat: S-W Pro Industrial Pro Cryl Universal Primer B66-1310 (5.0 wet, 2.0 dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Gloss, B2IW12651 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Gloss, B2IW12651 Series
(4 mils wet, 2 mils dry per coat)

b. Semi-Gloss Finish:

1st Coat: 1st Coat: S-W Pro Industrial Pro Cryl Universal Primer B66-1310 (5.0 wet, 2.0 dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss B3IW12651 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss B3IW12651 Series
(4 mils wet, 1.3 mils dry per coat)

c. Flat Finish:

1st Coat: 1st Coat: S-W Pro Industrial Pro Cryl Universal Primer B66-1310 (5.0 wet, 2.0 dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Flat Wall Paint, B3OW12651

3rd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW12651
(4 mils wet, 1.4 mils dry)

G. WOOD - Walls, Ceilings, Doors, Trim, Cabinet Work, Counters, Partitions, Frames Including Sitka Spruce, Southern Pine, Douglas Fir, Cedar, Redwood, Lauan)

1. Latex Systems:

a. Gloss Finish:

1st Coat: S-W Premium Wall & Wood Primer, B28W81111
(4 mils wet, 2 mils dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Gloss, B2IW12651 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Gloss, B2IW12651 Series
(4 mils wet, 2 mils dry per coat)

b. Semi-Gloss Finish:

1st Coat: S-W Premium Wall & Wood Primer, B28W81111
(4 mils wet, 2 mils dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31W02651 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B3IW02651 Series
(4 mils wet, 1.5 mils dry per coat)

c. Egg-Shell Finish:

1st Coat: S-W Premium Wall & Wood Primer, B28W81111
(4 mils wet, 2 mils dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Egg-Shell, B2OW12651 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Egg-Shell, B2OW12651 Series
(4 mils wet, 1.5 mils dry per coat)

d. Flat Finish:

1st Coat: S-W Premium Wall & Wood Primer, B28W81111
(4 mils wet, 2 mils dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Flat Wall Paint, B3OW12651

3rd Coat: S-W ProMar 200 Zero VOC Latex Flat Wall Paint, B3OW12651
(4 mils wet, 1.4 mils dry per coat)

H. DRYWALL - (Walls, Ceilings, Gypsum Board, Etc.)

1. Latex Systems:

a. Gloss Finish:

1st Coat: S-W ProMar 200 Latex Wall Primer, B28W02600
(4 mils wet, 1.2 mils dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Gloss, B2IW12651 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Gloss, B2IW12651 Series
(4 mils wet, 2 mils dry per coat)

b. Semi-Gloss Finish:

1st Coat: S-W ProMar 200 Latex Wall Primer, B28W02600
(4 mils wet, 1.2 mils dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B3IW02651 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B3IW02651 Series
(4 mils wet, 1.3 mils dry per coat)

c. Egg-Shell Finish:

1st Coat: S-W ProMar 200 Latex Wall Primer, B28W02600
(4 mils wet, 1.2 mils dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Egg-Shell, B2OW12651 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Egg-Shell, B2OW12651 Series
(4 mils wet, 1.6 mils dry per coat)

d. Flat Finish:

1st Coat: S-W ProMar 200 Latex Wall Primer B28W02600
(4 mils wet, 1.2 mils dry)

2nd Coat: S-W ProMar 200 Zero VOC Latex Flat Wall Paint, B3OW12651

3rd Coat: S-W ProMar 200 Zero VOC Latex Flat Wall Paint, B3OW12651
(4 mils wet, 1.4 mils dry per coat)

END OF SECTION 099123

PART 1: GENERAL

1.1 Description of Work

- A. Work in this section includes furnishing and installation of extruded aluminum overhead hanger rod style canopies as manufactured by Mapes Industries Inc.
- B. Related Items and Considerations
 - 1. Flashing of various designs may be required. Supplied by the installer.
 - 2. Determine wall construction, make-up and thickness.
 - 3. Ensure adequate wall condition to carry canopy loads where required.
 - 4. Consider water drainage away from canopy where necessary.
 - 5. Any necessary removal or relocation of existing structures, obstructions or materials.

1.2 Quality Assurance

- A. Products meeting these specifications established standard of quality required as manufactured by Mapes Industries, Inc. Lincoln, Nebraska 1-888-273-1132.

1.3 Field Measurement

- A. Confirm dimensions prior to preparation of shop drawings when possible.
- B. If requested, supply manufacturer's standard literature and specifications for canopies.
- C. Submit shop drawings showing structural component locations/positions, material dimensions and details of construction and assembly.

1.4 Performance Requirements

- A. Canopy must conform to local building codes.
- B. Determine if specific load requirements have been established for canopies and if stamped calculations are required for location in which canopy is installed.

1.5 Deliver, Storage, Handling

- A. Deliver and store all canopy components in protected areas.

PART 2: PRODUCTS

2.1 Manufacturer

- A. Mapes Canopies
Lincoln, Nebraska
Phone: 1-888-273-
1132. Fax: 1-877-
455-6572.

2.2 Materials

- A. Decking and fascia shall be extruded aluminum, alloy 6063-T6, in profile and thickness shown in current Mapes brochures.
- B. Decking Shall be 2 3/4" Extruded .078" Decking
- C. Hanger rods and attachment hardware shall be powder coated to match canopy.
- D. Fascia shall be standard 8" extruded "J" style (minimum .125 aluminum)

2.3 Finishes

- A. Standard factory options are clear anodized, bronze baked enamel or white baked enamel.
- B. Optional finishes include standard two-coat Kynar® colors.

2.4 Fabrication

- A. All connections shall be mechanically assembled utilizing 3/16" fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.
- B. Decking shall be designed with interlocking extruded aluminum members with mechanical fasteners field applied to provide structural integrity for the completed assembly.
- C. Concealed drainage. Water shall drain from covered surfaces into integral fascia gutter and directed to either the front for front drainage or to the rear for ground level discharge via one or more designated downspouts.

PART 3: EXECUTION

3.1 Inspection

- A. Confirm that surrounding area is ready for the canopy installation.
- B. Installer shall confirm dimensions and elevations to be as shown on drawings provided by Mapes Industries.
- C. Erection shall be performed by an approved installer and scheduled after all concrete, masonry and roofing in the area is completed

3.2 Installation

- A. Installation shall be in strict accordance with manufacturer's shop drawings. Particular attention should be given to protecting the finish during handling and erection.

3.3 After installation, entire system shall be left in a clean condition.

END OF SECTION 013125

SECTION 220000 – PLUMBING SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 22, and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Work covered under Plumbing contract.
 - 2. Work under other contracts.
 - 3. Use of premises.
 - 4. Owner's occupancy requirements.
 - 5. Specification formats and conventions.
- B. Related Sections include the following:
 - 1. Division 22 Sections.

1.3 WORK COVERED UNDER PLUMBING CONTRACT

- A. Provide all labor, materials, tools, machinery, equipment, and services necessary to complete the plumbing work under this contract. All systems and equipment shall be complete in every respect and all items of material, equipment, and labor shall be provided for a fully operational system. Coordinate the work with work of other trades so as to resolve conflicts without impeding job progress. The plumbing work includes the following:
- B. The plumbing contractor shall furnish all labor, materials, equipment, rigging, appliances, tools and accessories required for providing, installing, connecting and testing the new plumbing system, associated work, controls etc., in accordance with these specifications and the applicable drawings. The work includes:
 - 1. Furnish and install hot and cold domestic water piping with domestic hot water piping.
 - 2. Furnish and install new drain, fixtures waste, and vent pipes and floor drains. Coordinate all slopes and inverts.
 - 3. Furnish and install new plumbing fixtures, valves, strainers, cleanouts, accessories, etc. as specified on the drawings and in the specifications.
 - 4. Provide extension of gas lines to all gas fired HV/HVAC equipment, as called out on the drawings. Coordinate installation with local gas provider. Contractor to arrange with local gas provider to bring new gas service to the building. Pay for all permits and fees.
 - 5. Provide insulation for all domestic cold water, domestic hot water, storm piping, and roof drain pans. Insulation shall be continuous for the entire length of the pipe and provided with high density insulation at hangers and supports with shields at hangers.
 - 6. Provide identification tags for all piping.
 - 7. Provide proper piping supports, hangers, anchors, spring isolation hangers, etc.
 - 8. Provide proper slope to all piping as per National Standard Plumbing Code and other applicable codes.

9. Pressure test all piping for any leakage. Provide pressure test reports (six (6) copies) to the Owner/Architect for review.
10. Paint all non-insulated piping. New exterior gas piping shall be painted yellow.
11. Provide backflow preventers, shut-off valves, pressure reducing valves, relief valves, etc. for cold water piping connections to heating equipment as per local building codes.
12. Provide gas pressure regulators for all appliances and heating equipment connected to gas piping.

1.4 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

1.5 USE OF PREMISES

- A. General: Each Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 1. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
 2. Driveways and Entrances: Keep driveways parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Maintain existing building in a weather tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.6 OWNER'S OCCUPANCY REQUIREMENTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction.
- B. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.
 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- C. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial

Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed.

1.7 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 220000

SECTION 220501 – BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Mechanical sleeve seals.
 - 5. Sleeves.
 - 6. Escutcheons.
 - 7. Grout.
 - 8. Equipment installation requirements common to equipment sections.
 - 9. Painting and finishing.
 - 10. Supports and anchorages.

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.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.
 - 3. PE: Polyethylene plastic.
 - 4. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. 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.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 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 manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
 - 1. Manufacturers:
 - a. Eclipse, Inc.
 - b. Epco Sales, Inc.
 - c. Watts Industries, Inc.; Water Products Div.
 - d. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
 - 1. Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Epco Sales, Inc.
 - c. Watts Industries, Inc.; Water Products Div.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Manufacturers:
 - a. Calpico, Inc.
 - b. Central Plastics Company.
 - c. Pipeline Seal and Insulator, Inc.
 - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.

2.5 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.

- d. Pipeline Seal and Insulator, Inc.
- 2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- 3. Pressure Plates: Carbon steel or Stainless steel. Include two for each sealing element.
- 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.

2.7 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece/Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.
- D. One-Piece/Split-Plate, Stamped-Steel Type: With concealed or exposed-rivet hinge, set screw or spring clips, and chrome-plated finish.
- E. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- F. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.8 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Cast-brass type with polished chrome-plated finish.
 - g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - h. Bare Piping in Equipment Rooms: One-piece, cast-brass type or One-piece, stamped steel type.
 - i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

- M. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
 - b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.
 - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Delete first subparagraph below if not required.
 - 1) Seal space outside of sleeve fittings with grout.
 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
- O. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using 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.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
- R. Verify final equipment locations for roughing-in.
- S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. 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.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

- A. Painting of mechanical systems, equipment, and components is specified.
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.8 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout around anchors.
- G. Cure placed grout.

END OF SECTION 220501

SECTION 220517 – SLEEVES AND SLEEVE SEALS 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. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends. PVC sleeves in first paragraph below may be prohibited by fire authorities having jurisdiction.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms. PVC sleeves in paragraph below may be prohibited by fire authorities having jurisdiction.
- G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

- A. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
- B. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
- B. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- C. Pressure Plates: Stainless steel.
- D. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

- A. Standard: ASTM C 1107/C 1107M, 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 (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
- C. Sleeves are not required for core-drilled holes.
- D. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
- E. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
- F. Cut sleeves to length for mounting flush with both surfaces.
- G. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
- H. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- I. Install sleeves for pipes passing through interior partitions.

- J. Cut sleeves to length for mounting flush with both surfaces.
- K. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
- L. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- M. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping

3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
- B. Install fittings that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
- C. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing.
- D. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level.
- E. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
- F. Using grout, seal the space around outside of stack-sleeve fittings.
- G. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping.

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 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.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:

- B. Exterior Concrete Walls above Grade:

1. Piping Smaller Than NPS 6: Cast-iron wall sleeves
2. Piping NPS 6 and Larger: Cast-iron wall sleeves.

- C. Exterior Concrete Walls below Grade:

1. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system
2. Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
3. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.
4. Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

- D. Concrete Slabs-on-Grade:

1. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.
2. Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
3. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.
4. Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

- E. Concrete Slabs above Grade:

1. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
2. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

- F. Interior Partitions:

1. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
2. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 220517

SECTION 220518 – ESCUTCHEONS 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. Escutcheons.
- 2. Floor plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.
- E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
- C. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
2. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
3. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
4. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
5. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
6. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
7. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
8. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
9. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
10. Bare Piping in Equipment Rooms: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
11. Bare Piping in Equipment Rooms: One-piece, stamped-steel type or split-plate, stamped steel type with concealed hinge.

D. Install floor plates for piping penetrations of equipment-room floors.

E. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

SECTION 220519 – METERS AND GAGES 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. Bimetallic-actuated thermometers.
2. Liquid-in-glass thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.
6. Test plugs.

- B. Related Sections:

1. Section 221116 "Domestic Water Piping" for water meters inside the building.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of meter and gage, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

- A. Manufacturers:

1. Palmer - Wahl Instruments Inc.
2. Terice, H. O. Co.
3. Weiss Instruments, Inc.
4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

- B. Standard: ASME B40.200.
- C. Case: Liquid-filled and sealed type(s); stainless steel with 5-inch (127-mm) nominal diameter.
- D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg. F.
- E. Connector Type(s): Union joint, adjustable angle or rigid, with unified-inch screw threads.
- F. Connector Size: 1/2 inch (13 mm) with ASME B1.1 screw threads.
- G. Stem: 0.25 or 0.375 inch (6.4 or 9.4 mm) in diameter; stainless steel.
- H. Window: Plain glass.
- I. Ring: Stainless steel.
- J. Element: Bimetal coil.
- K. Pointer: Dark-colored metal.
- L. Accuracy: Plus or minus 1 percent of scale range.

2.2 LIQUID-IN-GLASS THERMOMETERS

- A. Manufacturers:
 - 1. Palmer - Wahl Instruments Inc.
 - 2. Trerice, H. O. Co.
 - 3. Weiss Instruments, Inc.
 - 4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
- B. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:
 - 1. Standard: ASME B40.200.
 - 2. Case: Cast aluminum, 6-inch (152-mm) nominal size.
 - 3. Case Form: Back angle or Straight unless otherwise indicated.
 - 4. Tube: Glass with magnifying lens and blue [or red] organic liquid.
 - 5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg. F.
 - 6. Window: Glass or plastic.
 - 7. Stem: Aluminum or brass and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
 - 8. Connector: 3/4 inch (19 mm), with ASME B1.1 screw threads.
 - 9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.
- C. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
 - 1. Standard: ASME B40.200.
 - 2. Case: Cast aluminum, 9-inch (229-mm) nominal size unless otherwise indicated.
 - 3. Case Form: Adjustable angle, Back angle or Straight unless otherwise indicated.
 - 4. Tube: Glass with magnifying lens and blue or red organic liquid.
 - 5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg. F.

6. Window: Glass.
7. Stem: Aluminum and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
8. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: [CNR] [or] [CUNI] <Insert material>.
4. Material for Use with Steel Piping: [CRES] [CSA] <Insert material>.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Manufacturers:

1. Palmer - Wahl Instruments Inc.
2. Terice, H. O. Co.
3. Weiss Instruments, Inc.
4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Standard: ASME B40.100.
2. Case: [Liquid-filled] [Sealed] [Open-front, pressure relief] [Solid-front, pressure relief] type(s); cast aluminum; 4-1/2-inch (114-mm) nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with [NPS 1/4 (DN 8)] [NPS 1/4 or NPS 1/2 (DN 8 or DN 15)] [NPS 1/2 (DN 15)], ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Stainless steel.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of.

C. Remote-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Standard: ASME B40.100.
2. Case: Liquid-filled, Sealed type; cast aluminum; 4-1/2-inch (114-mm) nominal diameter with [back] [front] flange and holes for panel mounting.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with [NPS 1/4 (DN 8)] [NPS 1/4 or NPS 1/2 (DN 8 or DN 15)] [NPS 1/2 (DN 15)], ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Stainless steel.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of.

2.5 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with [NPS 1/4 (DN 8)] [NPS 1/4 or NPS 1/2 (DN 8 or DN 15)] [NPS 1/2 (DN 15)], ASME B1.20.1 pipe threads and [piston] [porous-metal]-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass or stainless-steel needle, with [NPS 1/4 (DN 8)] [NPS 1/4 or NPS 1/2 (DN 8 or DN 15)] [NPS 1/2 (DN 15)], ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

- A. Description: Test-station fitting made for insertion into piping tee fitting.
- B. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- C. Thread Size: [NPS 1/4 (DN 8)] [or] [NPS 1/2 (DN 15)], ASME B1.20.1 pipe thread.
- D. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).
- E. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending [a minimum of 2 inches (51 mm) into fluid and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.

- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.
- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install remote-mounted pressure gages on panel.
- I. Install valve and snubber in piping for each pressure gage for fluids.
- J. Install test plugs in piping tees.
- K. Install thermometers in the following locations:
 - 1. Inlet and outlet of each water heater.
- L. Install pressure gages in the following locations:
 - 1. Suction and discharge of each domestic water pump.

3.2 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

- A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:
 - 1. Liquid-filled or Sealed, bimetallic-actuated type.
 - 2. Industrial]-style, liquid-in-glass type.
 - 3. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.
- B. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F (Minus 20 to plus 50 deg C).
- B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F (0 to 150 deg C).
- C. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be one of the following:

1. Liquid-filled, Sealed, direct-mounted, metal case.
2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

D. Pressure gages at suction and discharge of each domestic water pump shall be one of the following:

1. Liquid-filled, Sealed, direct-mounted, metal case.
2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

3.6 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Water Service Piping: 0 to 200 psi (0 to 1400 kPa).
- B. Scale Range for Domestic Water Piping: 0 to 200 psi (0 to 1400 kPa).

END OF SECTION 220519

SECTION 220523 – VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following general-duty valves (Lead Free Type):
 - 1. Copper-alloy ball valves.
 - 2. Ferrous-alloy ball valves.
 - 3. Bronze check valves.
 - 4. Ferrous-alloy wafer check valves.
 - 5. Spring-loaded, lift-disc check valves.
 - 6. Bronze gate valves.
 - 7. Bronze globe valves.
- B. Related Sections include the following:
 - 1. Division 22 Section for valve tags and charts.
 - 2. Division 22 piping Sections for specialty valves applicable to those Sections only.
- C. All valves and fittings for portable water system shall be lead-free type in compliant with requirements of NSF/ANSI Standard 61.

1.3 DEFINITIONS

- A. The following are standard abbreviations for valves:
 - 1. CWP: Cold working pressure.
 - 2. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 3. NBR: Acrylonitrile-butadiene rubber.
 - 4. PTFE: Polytetrafluoroethylene plastic.
 - 5. SWP: Steam working pressure.
 - 6. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.5 QUALITY ASSURANCE

- A. ASME Compliance: ASME B31.1 for power piping valves and ASME B31.9 for building services piping valves.
 - 1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.
- B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- 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 angle, gate, and globe valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. 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 hand-wheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 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 manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 VALVES, GENERAL

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.
- B. Bronze/Brass Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.

- C. Ferrous Valves: NPS 2-1/2 (DN 65) and larger with flanged ends, unless otherwise indicated.
- D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- F. Valve Actuators:
 - 1. Chain wheel: For attachment to valves, of size and mounting height, as indicated in the "Valve Installation" Article in Part 3.
 - 2. Gear Drive: For quarter-turn valves NPS 8 (DN 200) and larger.
 - 3. Hand wheel: For valves other than quarter-turn types.
 - 4. Lever Handle: For quarter-turn valves NPS 6 (DN 150) and smaller, except plug valves.
 - 5. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.
- G. Extended Valve Stems: On insulated valves.
- H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
- I. Valve Grooved Ends: AWWA C606.
 - 1. Solder Joint: With sockets according to ASME B16.18.
 - a. Caution: Use solder with melting point below 840 deg F (454 deg C) for angle, check, gate, and globe valves; below 421 deg F (216 deg C) for ball valves.
 - 2. Threaded: With threads according to ASME B1.20.1.
- J. Valve Bypass and Drain Connections: MSS SP-45.

2.3 COPPER-ALLOY BALL VALVES

- A. Available Manufacturers:
- B. Manufacturers:
 - 1. One-Piece, Copper-Alloy Ball Valves:
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Div.
 - c. Grinnell Corporation.
 - d. Kitz Corporation of America.
 - e. Legend Valve & Fitting, Inc.
 - f. NIBCO INC.
 - g. Watts Industries, Inc.; Water Products Div.
- C. Copper-Alloy Ball Valves, General: MSS SP-110, full port type.
- D. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats, full port type.

2.4 FERROUS-ALLOY BALL VALVES

- A. Available Manufacturers:
- B. Manufacturers:
 - 1. American Valve, Inc.
 - 2. Conbraco Industries, Inc.; Apollo Div.
 - 3. Cooper Cameron Corp.; Cooper Cameron Valves Div.
 - 4. Flow-Tek, Inc.
 - 5. Hammond Valve.
 - 6. Kitz Corporation of America.
 - 7. KTM Products, Inc.
 - 8. Milwaukee Valve Company.
 - 9. NIBCO INC.
 - 10. Richards Industries; Marwin Ball Valves.
- C. Ferrous-Alloy Ball Valves, General: MSS SP-72, with flanged ends, full port.
- D. Ferrous-Alloy Ball Valves: Class 150, full port.

2.5 BRONZE CHECK VALVES

- A. Available Manufacturers:
- B. Manufacturers:
 - 1. Type 1, Bronze, Horizontal Lift Check Valves with Metal Disc:
 - a. Cincinnati Valve Co.
 - b. Red-White Valve Corp.
 - c. Walworth Co.
 - 2. Type 1, Bronze, Vertical Lift Check Valves with Metal Disc:
 - a. Cincinnati Valve Co.
 - b. Red-White Valve Corp.
 - c. NIBCO INC.
 - 3. Type 3, Bronze, Swing Check Valves with Metal Disc:
 - a. American Valve, Inc.
 - b. Cincinnati Valve Co.
 - c. Grinnell Corporation.
 - d. Hammond Valve.
 - e. Kitz Corporation of America.
 - f. Legend Valve & Fitting, Inc.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell, Wm. Co.
 - j. Red-White Valve Corp.
 - k. Walworth Co.
 - l. Watts Industries, Inc.; Water Products Div.
- C. Bronze Check Valves, General: MSS SP-80.
- D. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.

- E. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.
- F. Type 3, Class 150, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.

2.6 FERROUS-ALLOY WAFER CHECK VALVES

- A. Available Manufacturers:
- B. Manufacturers:
 - 1. Dual-Plate, Ferrous-Alloy, Wafer-Lug Check Valves:
 - a. Gulf Valve Co.
 - b. Valve and Primer Corp.
 - c. NIBCO INC.
 - 2. Dual-Plate, Ferrous-Alloy, Double-Flanged-Type Check Valves:
 - a. Gulf Valve Co.
 - b. Techno Corp.
 - c. NIBCO INC.
- C. Ferrous-Alloy Wafer Check Valves, General: API 594, spring loaded.
- D. Dual-Plate, Class 125 or 150, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.

2.7 SPRING-LOADED, LIFT-DISC CHECK VALVES

- A. Available Manufacturers:
- B. Manufacturers:
 - 1. Type I, Wafer Lift-Disc Check Valves:
 - a. Mueller Steam Specialty.
 - 2. Type II, Compact-Wafer, Lift-Disc Check Valves:
 - a. Durabla Fluid Technology, Inc.
 - b. Flomatic Valves.
 - c. Grinnell Corporation.
 - d. Hammond Valve.
 - e. Metraflex Co.
 - f. Milwaukee Valve Company.
 - g. Mueller Steam Specialty.
 - h. NIBCO INC.
 - 3. Type III, Globe Lift-Disc Check Valves:
 - a. Durabla Fluid Technology, Inc.
 - b. GA Industries, Inc.
 - c. Grinnell Corporation.
 - d. Hammond Valve.
 - e. Metraflex Co.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - 4. Type IV, Threaded Lift-Disc Check Valves:
 - a. Check-All Valve Mfg. Co.
 - b. Durabla Fluid Technology, Inc.
 - c. Grinnell Corporation.

- d. Legend Valve & Fitting, Inc.
 - e. Metraflex Co.
 - f. Milwaukee Valve Company.
 - g. Mueller Steam Specialty.
 - h. NIBCO INC.
 - i. Watts Industries, Inc.; Water Products Div.
- C. Lift-Disc Check Valves, General: FCI 74-1, with spring-loaded bronze or alloy disc and bronze or alloy seat.
 - D. Type I, Class 125, Wafer Lift-Disc Check Valves: Wafer style with cast-iron shell with diameter matching companion flanges.
 - E. Type II, Class 125, Compact-Wafer, Lift-Disc Check Valves: Compact-wafer style with cast-iron shell with diameter made to fit within bolt circle.
 - F. Type III, Class 125, Globe Lift-Disc Check Valves: Globe style with cast-iron shell and flanged ends.
 - G. Type IV, Class 125, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.

2.8 BRONZE GATE VALVES

A. Available Manufacturers:

B. Manufacturers:

- 1. Type 1, Bronze, Non-Rising-Stem Gate Valves:
 - a. American Valve, Inc.
 - b. Cincinnati Valve Co.
 - c. Grinnell Corporation.
 - d. Hammond Valve.
 - e. Kitz Corporation of America.
 - f. Legend Valve & Fitting, Inc.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell, Wm. Co.
 - j. Red-White Valve Corp.
 - k. Walworth Co.
 - l. Watts Industries, Inc.; Water Products Div.
- 2. Type 2, Bronze, Rising-Stem, Solid-Wedge Gate Valves:
 - a. American Valve, Inc.
 - b. Cincinnati Valve Co.
 - c. Grinnell Corporation.
 - d. Hammond Valve.
 - e. Kitz Corporation of America.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Powell, Wm. Co.
 - i. Red-White Valve Corp.
 - j. Walworth Co.

C. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy hand wheel.

- D. Type 1, Class 150, Bronze Gate Valves: Bronze body with non-rising stem and bronze solid wedge and union-ring bonnet.
- E. Type 2, Class 150, Bronze Gate Valves: Bronze body with rising stem and bronze solid wedge and union-ring bonnet.

2.9 BRONZE GLOBE VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Type 1, Bronze Globe Valves with Metal Disc:
 - a. Cincinnati Valve Co.
 - b. Grinnell Corporation.
 - c. Hammond Valve.
 - d. Kitz Corporation of America.
 - e. Legend Valve & Fitting, Inc.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Powell, Wm. Co.
 - i. Red-White Valve Corp.
 - j. Walworth Co.
2. Type 2, Bronze Globe Valves with Nonmetallic Disc:
 - a. Cincinnati Valve Co.
 - b. Grinnell Corporation.
 - c. Hammond Valve.
 - d. Kitz Corporation of America.
 - e. McWane, Inc.; Kennedy Valve Div.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Powell, Wm. Co.
 - i. Red-White Valve Corp.
 - j. Walworth Co.
3. Type 3, Bronze Globe Valves with Renewable Seat and Metal Disc:
 - a. Cincinnati Valve Co.
 - b. Grinnell Corporation.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - f. Walworth Co.

- C. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy hand wheel.
- D. Type 1, Class 150, Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.
- E. Type 3, Class 150, Bronze Globe Valves: Bronze body with bronze disc and renewable seat. Include union-ring bonnet.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. 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.
- C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. 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.
- F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

- A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball or gate valves.
 - 2. Throttling Service: Ball or globe valves.
 - 3. Pump Discharge: Spring-loaded, lift-disc check valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Heating Water Piping: Use the following types of valves:
 - 1. Ball Valves, NPS 2 (DN 50) and Smaller: One or Two-piece, CWP rating, copper alloy.
 - 2. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
 - 3. Lift Check Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, horizontal / vertical, bronze.
 - 4. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.
 - 5. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
 - 6. Wafer Check Valves, NPS 2-1/2 (DN 65) and Larger: Single / Dual-plate, wafer-lug/ double-flanged, Class 150, ferrous alloy.
 - 7. Spring-Loaded, Lift-Disc Check Valves, NPS 2 (DN 50) and Smaller: Type IV, Class 150.
 - 8. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 (DN 65) and Larger: Class 125, cast iron.
 - 9. Gate Valves, NPS 2 (DN 50) and Smaller: Type 2 / 3, Class 150, bronze.
 - 10. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.

3.3 VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
 - 3. Lift Check Valves: With stem upright and plumb.

3.4 JOINT CONSTRUCTION

- A. Refer to Division 22 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 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.

END OF SECTION 220523

SECTION 220529 – 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. 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 233113 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

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.
 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.
- C. Provide hangers and supports with insulation shields in order to keep insulation fully in-tact.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Fiberglass pipe hangers.
3. Thermal-hanger shield inserts.
4. Powder-actuated fastener systems.
5. Pipe positioning systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Fiberglass strut systems. Include Product Data for components.
4. Pipe stands. Include Product Data for components.
5. Equipment supports.
6. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code Steel."

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
5. ASME Boiler and Pressure Vessel Code: Section IX.

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: Pre-galvanized 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. Manufacturers' catalogs indicate that copper pipe hangers are small, typically NPS 4 (DN 100) or smaller, and types available are limited.
2. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated 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. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688 kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig (688-kPa) ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or [ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) 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 (50 mm) 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] [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.

2.5 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.

5. 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.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

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, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
 1. Properties: Non-staining, noncorrosive, and nongaseous.
 2. Design Mix: 5000-psi (34.5-MPa), 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.
- C. 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.
- D. 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.
- E. Metal framing system in first paragraph below requires calculating and detailing at each use.
- F. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- G. Fiberglass strut system in first paragraph below requires calculating and detailing at each use.
- H. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping
- I. Fastener System Installation:
 1. Verify suitability of fasteners in two subparagraphs below for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick.
 2. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) 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.

3. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- J. Pipe stand in first paragraph below requires calculating and detailing at each use.
- K. 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.
 3. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- L. Equipment support in first paragraph below requires calculating and detailing at each use.
- M. Equipment Support Installation:
1. Fabricate from welded-structural-steel shapes.
 2. 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.
 3. Install lateral bracing with pipe hangers and supports to prevent swaying.
 4. Install building attachments within concrete slabs or attach to structural steel.
 5. Install additional attachments at concentrated loads, including valves, flanges, and strainers, [NPS 2-1/2 (DN 65)] <Insert size> and larger and at changes in direction of piping.
 6. 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.
 2. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
 3. Piping Operating Below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 4. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 5. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated.
 6. 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 (DN 100) and larger if pipe is installed on rollers.
 7. High-compressive-strength inserts may permit use of shorter shields or shields with less arc span. Revise first subparagraph below to suit Project.
 8. 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 (DN 100) and larger if pipe is installed on rollers.
- Q. Shield Dimensions for Pipe: Not less than the following:

1. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 2. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 3. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
 4. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
 5. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
- R. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
- S. 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 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 (40 mm).

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.
- B. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- C. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099123 "Interior Painting".
- D. 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 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, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper 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 non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), 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 non-insulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
 - 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
 - 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 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 (DN 100 to DN 900), 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 (DN 100 to DN 900), 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 (DN 65 to DN 900) 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 (DN 25 to DN 750), 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 (DN 65 to DN 600), 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 (DN 50 to DN 1050) 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 (DN 50 to DN 600) 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 (DN 50 to DN 750) 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 (DN 24 to DN 600).
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) 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 (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) 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 (49 to 232 deg C) 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-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. 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 (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).

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:
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 (32 mm).
 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 powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 220529

SECTION 220548 – VIBRATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Restrained spring isolators.
 - 2. Housed spring mounts.
 - 3. Spring hangers.
 - 4. Spring hangers with vertical-limit stops.
 - 5. Thrust limits.
 - 6. Pipe riser resilient supports.
- B. Definitions:
 - 1. A_v : Effective peak velocity related acceleration coefficient.

1.2 SUBMITTALS

- A. Product Data: Include load deflection curves for each vibration isolation device indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Include the following:
 - 1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
 - 3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
 - 4. Seismic-Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
 - 5. Details for Interlocking Snubbers: Include load deflection curves up to 1/2-inch deflection in x, y, and z planes.

1.3 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 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 manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 VIBRATION ISOLATORS

- A. Available Manufacturers:
 - 1. Ace Mounting Co., Inc.
 - 2. Amber/Booth Company, Inc.
 - 3. B-Line Systems, Inc.
 - 4. California Dynamics Corp.
 - 5. Isolation Technology, Inc.
 - 6. Kinetics Noise Control, Inc.
 - 7. Mason Industries, Inc.
 - 8. Vibration Eliminator Co., Inc.
 - 9. Vibration Isolation Co., Inc.
 - 10. Vibration Mountings & Controls/Korfund.
- B. Restrained Elastomeric Mounts: All-directional elastomeric mountings with seismic restraint.
 - 1. Materials: Cast-ductile-iron housing containing two separate and opposing, molded, bridge-bearing neoprene elements that prevent central threaded sleeve and attachment bolt from contacting the casting during normal operation.
 - 2. Neoprene: Shock-absorbing materials compounded as defined by AASHTO.
- C. Spring Isolators: Freestanding, laterally stable, open-spring isolators.
 - 1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 3. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
 - 4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - 5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 100 psig.
 - 6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.
- D. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
 2. Outside 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 the rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
- E. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.
1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
 2. Base: Factory drilled for bolting to structure.
 3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel before contacting a resilient collar.
- F. Elastomeric Hangers: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.
- G. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Outside 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 the 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. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
- H. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Outside 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 the 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. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
- 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 equipment.

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. Outside 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 the 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.
- J. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- thick, 60-durometer neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.
- K. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes separated by a minimum of 1/2-inch- thick, 60-durometer neoprene. Factory set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction. Shear pin shall be removable and re-insertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thrust limits at centerline of thrust, symmetrical on either side of equipment.
- B. Install restraining cables at each trapeze and individual pipe hanger. At trapeze anchor locations, shackle piping to trapeze. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.
- C. Install steel angles or channel, sized to prevent buckling, clamped with ductile-iron clamps to hanger rods for trapeze and individual pipe hangers. At trapeze anchor locations, shackle piping to trapeze. Requirements apply equally to hanging equipment. Do not weld angles to rods.
- D. Install resilient bolt isolation washers on equipment anchor bolts.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 1. Inspect isolator seismic-restraint clearance.
 2. Test isolator deflection.
 3. Inspect minimum snubber clearances.
- B. Provide certification report to A/E.

3.3 ADJUSTING

- A. Adjust isolators after piping systems have been filled and equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop.
- D. Adjust air spring leveling mechanism.
- E. Adjust active height of spring isolators.
- F. Adjust snubbers according to manufacturer's written recommendations.
- G. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.
- H. Torque anchor bolts according to equipment manufacturer's written recommendations to resist seismic forces.

END OF SECTION 220548

SECTION 220553 – IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following mechanical identification materials and their installation:
 - 1. Equipment nameplates
 - 2. Equipment markers
 - 3. Equipment signs
 - 4. Access panel and door markers
 - 5. Valve tags
 - 6. Pipe Markers

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
 - 1. Data:
 - a. Manufacturer, product name, model number, and serial number.
 - b. Capacity, operating and power characteristics, and essential data.
 - c. Labels of tested compliances.
 - 2. Location: Accessible and visible.
 - 3. Fasteners: As required to mount on equipment.
- B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
 - 1. Terminology: Match schedules as closely as possible.
 - 2. Data:
 - a. Name and plan number
 - b. Equipment service
 - c. Design capacity
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed

3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
- C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
1. Data: Instructions for operation of equipment and for safety procedures.
 2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
 3. Thickness: 1/8 inch, unless otherwise indicated.
 4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.
- D. Access Panel and Door Markers: 1/16-inch thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.
1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.2 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
1. Colors: Comply with ASME A13.1, unless otherwise indicated.
 2. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
 3. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
 4. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Pre-tensioned Pipe Markers: Pre-coiled semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.
- C. Shaped Pipe Markers: Preformed semi-rigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.
- D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.
- E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive, permanent-type, self-adhesive back.
1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
 2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

2.3 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme. Provide 5/32-inch hole for fastener.
 - 1. Material: 0.032 inch-thick brass/aluminum
 - 2. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 22 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
 - 1. Fuel-burning units, including boilers, furnaces, heaters
 - 2. Pumps and similar motor-driven units.
 - 3. Fans.
- B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
 - 1. Letter Size: Minimum 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.
 - 2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
 - 3. Locate markers where accessible and visible.
 - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
 - b. Meters, gages, thermometers, and similar units.
 - c. Fuel-burning units, including boilers, furnaces, heaters.
 - d. Pumps and similar motor-driven units.
 - e. Fans.
- C. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.
 - 1. Letter Size: Minimum 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.

2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
- D. Install access panel markers with screws on equipment access panels.

3.3 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
 1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.
 2. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 3/4 inch wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
 3. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.
 4. Pipes with OD, Including Insulation, 6 Inches and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.
- B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed 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 non-accessible 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 markers.

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; 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:
 1. Valve-Tag Size and Shape:
 - a. Hot Water: 1-1/2 inches, round/square
 - b. Gas: 1-1/2 inches, round/square
 - c. Steam: 1-1/2 inches, round/square

3.5 ADJUSTING AND CLEANING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.
- B. Clean faces of mechanical identification devices.

END OF SECTION 220553

SECTION 220719 – 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes mechanical insulation for duct, equipment, and pipe, including the following:
 - 1. Insulation Materials:
 - a. Cellular glass.
 - b. Mineral fiber.
 - c. Polystyrene.
 - 2. Fire-rated insulation systems.
 - 3. Adhesives.
 - 4. Mastics.
 - 5. Lagging adhesives.
 - 6. Sealants.
 - 7. Field-applied jackets.
 - 8. Tapes.
 - 9. Securements.
 - 10. Corner angles.

1.3 DEFINITIONS

- A. ASJ: All-service jacket.
- B. FSK: Foil, scrim, kraft paper.
- C. FSP: Foil, scrim, polyethylene.
- D. PVDC: Polyvinylidene chloride.
- E. SSL: Self-sealing lap.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- B. Shop Drawings: Show details for the following:
 - 1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Attachment and covering of heat tracing inside insulation.

3. Insulation application at pipe expansion joints for each type of insulation.
 4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 5. Removable insulation at piping specialties, equipment connections, and access panels.
 6. Application of field-applied jackets.
 7. Application at linkages of control devices.
 8. Field application for each equipment type.
- 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 (DN 50).
 2. Sheet Form Insulation Materials: 12 inches square.
 3. Jacket Materials for Pipe: 12 inches long by NPS 2 (DN 50).
 4. Sheet Jacket Materials: 12 inches square.
 5. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.
- D. Installer Certificates: Signed by Contractor certifying that installers comply with requirements.
- E. 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.
- F. Field quality-control inspection 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. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting 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.

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 size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports."
- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

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 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 INSULATION MATERIALS

- A. Refer to Part 3 schedule articles for requirements about 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 Part 2 "Factory-Applied Jackets" Article.
 - 1. Products:
 - a. Cell-U-Foam Corporation; Ultra-CUF.
 - b. Pittsburgh Corning Corporation; Foamglas Super K.
 - 2. Block Insulation: ASTM C 552, Type I.
 - 3. Special-Shaped Insulation: ASTM C 552, Type III.
 - 4. Board Insulation: ASTM C 552, Type IV.
 - 5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 - 6. Preformed Pipe Insulation with Factory-Applied [ASJ] [ASJ-SSL]: Comply with ASTM C 552, Type II, Class 2.
 - 7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000° 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 Part 2 "Factory-Applied Jackets" Article.
- H. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.
 - 1. Products:
 - a. Knauf Insulation; Permawick Pipe Insulation.
 - b. Owens Corning; VaporWick Pipe Insulation.
- I. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied [ASJ] [FSK jacket] complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
 - 1. Products:
 - a. CertainTeed Corp.; CrimpWrap.
 - b. Johns Manville; MicroFlex.
 - c. Knauf Insulation; Pipe and Tank Insulation.
 - d. Manson Insulation Inc.; AK Flex.
 - e. Owens Corning; Fiberglas Pipe and Tank Insulation.

2.3 FIRE-RATED INSULATION SYSTEMS

- A. Fire-Rated Board: Structural-grade, press-molded, xonolite calcium silicate, fireproofing board suitable for operating temperatures up to 1700 deg F. Comply with ASTM C 656, Type II, Grade 6. UL tested and certified to provide a 2-hour fire rating.
 - 1. Products:
 - a. Johns Manville; Super Firetemp M.
- B. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is UL tested and certified to provide a 2-hour fire rating.
 - 1. Products:
 - a. CertainTeed Corp.; FlameChek.
 - b. Johns Manville; Firetemp Wrap.
 - c. Nelson Firestop Products; Nelson FSB Flameshield Blanket.
 - d. Thermal Ceramics; FireMaster Duct Wrap.
 - e. 3M; Fire Barrier Wrap Products.
 - f. Unifrax Corporation; FyreWrap.
 - g. Vesuvius; PYROSCAT FP FASTR Duct Wrap.

2.4 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. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F.
 - 1. Products:
 - a. Childers Products, Division of ITW; CP-97.
 - b. Foster Products Corporation, H. B. Fuller Company; 81-27/81-93.
 - c. Marathon Industries, Inc.; 290.
 - d. Mon-Eco Industries, Inc.; 22-30.
 - e. Vimasco Corporation; 760.
- C. Cellular-Glass, Phenolic-Foam, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.
 - 1. Products:
 - a. Childers Products, Division of ITW; CP-96.
 - b. Foster Products Corporation, H. B. Fuller Company; 81-33.
- D. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 - 1. Products:
 - a. Aeroflex USA Inc.; Aero seal.
 - b. Armacell LCC; 520 Adhesive.
 - c. Foster Products Corporation, H. B. Fuller Company; 85-75.
 - d. RBX Corporation; Rubatex Contact Adhesive.
- E. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.

- F. Polystyrene Adhesive: Solvent- or water-based, synthetic resin adhesive with a service temperature range of minus 20 to plus 140 deg F.
 1. Products:
 - a. Childers Products, Division of ITW; CP-96.
 - b. Foster Products Corporation, H. B. Fuller Company; 97-13.

- G. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 1. Products:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.

- H. PVC Jacket Adhesive: Compatible with PVC jacket.
 1. Products:
 - a. Dow Chemical Company (The); 739, Dow Silicone.
 - b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
 - c. P.I.C. Plastics, Inc.; Welding Adhesive.
 - d. Red Devil, Inc.; Celulon Ultra Clear.
 - e. Speedline Corporation; Speedline Vinyl Adhesive.

2.5 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
 1. Products:
 - a. Childers Products, Division of ITW; CP-35.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-90.
 - c. ITW TACC, Division of Illinois Tool Works; CB-50.
 - d. Marathon Industries, Inc.; 590.
 - e. Mon-Eco Industries, Inc.; 55-40.
 - f. Vimasco Corporation; 749.
 2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
 5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products:
 - a. Childers Products, Division of ITW; CP-30.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-35.
 - c. ITW TACC, Division of Illinois Tool Works; CB-25.
 - d. Marathon Industries, Inc.; 501.
 - e. Mon-Eco Industries, Inc.; 55-10.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products:
 - a. Childers Products, Division of ITW; Encacel.
 - b. Foster Products Corporation, H. B. Fuller Company; 60-95/60-96.
 - c. Marathon Industries, Inc.; 570.
 - d. Mon-Eco Industries, Inc.; 55-70.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products:
 - a. Childers Products, Division of ITW; CP-10.
 - b. Foster Products Corporation, H. B. Fuller Company; 35-00.
 - c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
 - d. Marathon Industries, Inc.; 550.
 - e. Mon-Eco Industries, Inc.; 55-50.
 - f. Vimasco Corporation; WC-1/WC-5.
2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F.
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.6 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Products:
 - a. Childers Products, Division of ITW; CP-52.
 - b. Foster Products Corporation, H. B. Fuller Company; 81-42.
 - c. Marathon Industries, Inc.; 130.
 - d. Mon-Eco Industries, Inc.; 11-30.
 - e. Vimasco Corporation; 136.
2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F.
4. Color: White.

2.7 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic-Foam, and Polyisocyanurate Products:
 - a. Childers Products, Division of ITW; CP-76.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-45.
 - c. Marathon Industries, Inc.; 405.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Pittsburgh Corning Corporation; Pittseal 444.
 - f. Vimasco Corporation; 750.
2. Joint Sealants for Polystyrene Products:
 - a. Childers Products, Division of ITW; CP-70.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-45/30-46.
 - c. Marathon Industries, Inc.; 405.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Vimasco Corporation; 750.
3. Materials shall be compatible with insulation materials, jackets, and substrates.
4. Permanently flexible, elastomeric sealant.
5. Service Temperature Range: Minus 100 to plus 300 deg F.
6. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Products:
 - a. Childers Products, Division of ITW; CP-76-8.
 - b. Foster Products Corporation, H. B. Fuller Company; 95-44.
 - c. Marathon Industries, Inc.; 405.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Vimasco Corporation; 750.
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.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products:
 - a. Childers Products, Division of ITW; 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.

2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. 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:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto PVC 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.
 5. Factory-fabricated tank heads and tank side panels.
- D. Metal Jacket:
1. Products:
 - a. Childers Products, Division of ITW; Metal Jacketing Systems.
 - b. PABCO Metals Corporation; Surefit.
 - c. RPR Products, Inc.; Insul-Mate.
- E. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.
1. Products:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
 - b. Compac Corp.; 104 and 105.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
 - 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 and UL listed.
1. Products:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - b. Compac Corp.; 110 and 111.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
 - d. Venture Tape; 1525 CW, 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:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
 - b. Compac Corp.; 130.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
 - d. 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 and UL listed.

1. Products:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - b. Compac Corp.; 120.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
 - 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.

2.10 SECUREMENTS

- A. Bands:

1. Products:
 - a. Childers Products; Bands.
 - b. PABCO Metals Corporation; Bands.
 - c. RPR Products, Inc.; Bands.
2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch thick, 3/4 inch wide with wing or closed seal.
3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

- B. Insulation Pins and Hangers:

1. 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.
 - a. Products:
 - 1) AGM Industries, Inc.; CWP-1.
 - 2) GEMCO; CD.
 - 3) Midwest Fasteners, Inc.; CD.
 - 4) Nelson Stud Welding; TPA, TPC, and TPS.

2. 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.
 - a. Products:
 - 1) AGM Industries, Inc.; CWP-1.
 - 2) GEMCO; Cupped Head Weld Pin.
 - 3) Midwest Fasteners, Inc.; Cupped Head.
 - 4) Nelson Stud Welding; CHP.
 3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Products:
 - 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
 - 2) GEMCO; Perforated Base.
 - 3) Midwest Fasteners, Inc.; Spindle.
 - b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - c. Spindle: Aluminum, fully annealed, 0.106-inch diameter shank, length to suit depth of insulation indicated.
 - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
 4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick, aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Products:
 - 1) AGM Industries, Inc.; RC-150.
 - 2) GEMCO; R-150.
 - 3) Midwest Fasteners, Inc.; WA-150.
 - 4) Nelson Stud Welding; Speed Clips.
 - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch wide, stainless steel or Monel.
- D. Wire: 0.062-inch soft-annealed, galvanized steel.
1. Manufacturers:
 - a. ACS Industries, Inc.
 - b. C & F Wire.
 - c. Childers Products.
 - d. PABCO Metals Corporation.
 - e. RPR Products, Inc.

2.11 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005; Temper H-14.
- C. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
 - 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
 - 3. 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. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with epoxy primer 5 mils thick and epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 COMMON INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.

- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches or 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. 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. Manholes.
5. Handholes.
6. 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 Below-Grade 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. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
- F. Insulation Installation at Floor Penetrations:
 1. Pipe: Install insulation continuously through floor penetrations.

3.5 EQUIPMENT INSULATION INSTALLATION

- A. Secure insulation with adhesive and anchor pins and speed washers.
 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.

2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
 - a. Do not weld anchor pins to ASME-labeled pressure vessels.
 - b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
 - c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
 - d. Do not over compress insulation during installation.
 - e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
 - f. Impale insulation over anchor pins and attach speed washers.
 - g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

3.6 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, vessels, and equipment. 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 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.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.7 CELLULAR-GLASS INSULATION INSTALLATION

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 but 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.

3.8 MINERAL-FIBER INSULATION INSTALLATION

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 but 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 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.

B. 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 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous UL-listed fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies.

3.11 FINISHES

- A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

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. Fire-suppression piping.
 - 2. Drainage piping located in crawl spaces.
 - 3. Below-grade piping.
 - 4. 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 3 (DN 75) and Smaller: Insulation shall be any of the following:
 - a. Cellular Glass: 1-1/2 inch thick.
 - b. Mineral-Fiber Pipe Insulation, Type I: 1-1/2 inch thick.
 - 2. NPS 4 (DN 32) and Larger: Insulation shall be any of the following:
 - a. Cellular Glass: 2 inches thick.
 - b. Mineral-Fiber Pipe Insulation, Type I: 2 inches thick.
- B. Domestic Hot and Recirculated Hot Water:
 - 1. NPS 3 (DN 75) and Smaller: Insulation shall be any of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Mineral-Fiber Pipe Insulation, Type I: 1-1/2 inch thick.
 - 2. NPS 4 (DN 100) and Larger: Insulation shall be any of the following:
 - a. Cellular Glass: 2 inches thick.
 - b. Mineral-Fiber Pipe Insulation, Type I: 2 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, Exposed:
 - 1. Aluminum, Smooth: 0.016 inch thick.

END OF SECTION 220719

SECTION 221116 – 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes domestic water piping inside the building and 5 feet to outside of the building.
- B. Related Sections include the following:
 - 1. Division 22 Section "Domestic Water Piping Specialties" for water distribution piping specialties.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing domestic water piping systems with 80 psig, unless otherwise indicated.

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Water Samples: Specified in Part 3 "Cleaning" Article.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.3 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Types K and L (ASTM B 88M, Types A and B), water tube, annealed temper.
 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
 3. 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.
- B. Hard Copper Tube: ASTM B 88, Types L and M (ASTM B 88M, Types B and C), water tube, drawn temper.
 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
 3. 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.

2.4 CPVC PIPING

- A. CPVC Pipe: ASTM F 441/F 441M, Schedule 40.
 1. CPVC Socket Fittings: ASTM F 438 for Schedule 40.
- B. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.
- C. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

2.5 PEX TUBE AND FITTINGS

- A. PEX Distribution System: ASTM F 877, SDR 9 tubing.

- B. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.
- C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

2.6 VALVES

- A. General-duty ball valves are specified in Division 22 Section "Valves."
- B. Backflow preventers, strainers, and drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

PART 3 - EXECUTION

3.1 PIPE AND FITTING APPLICATIONS

- 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 may be used on aboveground piping, unless otherwise indicated.
- C. Fitting Option: brazed joints may be used on aboveground copper tubing.
- D. Under-Building-Slab, Domestic Water Piping on House Side of Water Meter, NPS 4 (DN 100) and Smaller: Soft copper tube, Type K with no fittings.
- E. Aboveground Domestic Water Piping: Use the following piping materials for each size range:
 - 1. NPS 1 (DN 25) and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
 - 2. NPS 2 (DN 50): Hard copper tube, Type L; copper pressure fittings; and soldered joints.

3.2 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball valves for piping NPS 3 (DN 75) and smaller.
 - 2. Drain Duty: Hose-end drain valves.
- B. Install drain valves at low points in horizontal piping, and where required to drain water piping.
 - 1. Install hose-end drain valves at low points in water mains, risers, and branches.

3.3 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 22 Section "Basic Mechanical Materials and Methods."

- B. Install under-building-slab copper tubing according to CDA's "Copper Tube Handbook."
- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- E. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

3.4 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Seismic-restraint devices are specified in Division 22 Section "Mechanical Vibration and Seismic Controls."
- B. Pipe hanger and support devices are specified in Division 22 Section "Hangers and Supports." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - 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: MSS Type 49, spring cushion rolls, if indicated.
 - 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. Install supports according to Division 22 Section "Hangers and Supports."
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
- F. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 (DN 20) and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches with 3/8-inch rod.
 - 4. NPS 2-1/2 (DN 65): 108 inches with 1/2-inch rod.
 - 5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet with 1/2-inch rod.
 - 6. NPS 6 (DN 150): 10 feet with 5/8-inch rod.

- G. Install supports for vertical copper tubing every 10 feet.

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 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
 - 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 24 hours 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 test or inspection, make required corrections and arrange for reinspection.
 - 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test domestic water piping as follows:
 - 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 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 required corrective action.

3.8 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. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
4. Remove and clean strainer screens. Close drain valves and replace drain plugs.
5. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.9 CLEANING

- A. Clean and disinfect potable and non-potable domestic water piping as follows:
 1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as 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.

END OF SECTION 221116

SECTION 221119 – 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. Section Includes:

- 1. Balancing valves.
 - 2. Strainers.
 - 3. Drain valves.
 - 4. Air vents.
 - 5. Hose bibbs.
 - 6. Wall hydrants.
 - 7. Water hammer arresters.
 - 8. Trap-seal primer valves.
 - 9. Trap-seal primer systems.

- B. Related Sections include the following:

- 1. Division 22 Section "Meters and Gages" for thermometers, pressure gages, and flow meters in domestic water piping.

1.3 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 80 psig, unless otherwise indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports.
- D. 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 BALANCING VALVES

A. Copper-Alloy Calibrated 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:
2. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawings or a comparable product by one of the following:
 - a. To require a specific valve type (ball, globe, or Y-pattern globe) or a specific material (brass or bronze), verify its availability with manufacturer.
 1. Armstrong International, Inc.
 2. ITT Industries; Bell & Gossett Div.
 3. NIBCO INC.
 4. Taco, Inc.
 5. Watts Industries, Inc.; Water Products Div.
 6. Or approved equal.
3. Type: Ball or Y-pattern globe valve with two readout ports and memory setting indicator.
4. Body: Brass or bronze,
5. Size: Same as connected piping, but not larger than NPS 2 (DN 50).
6. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. 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; Crane Valves.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - f. Red-White Valve Corp.
 - g. Or approved equal.
2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 (DN 50) 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.

2.2 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and] for NPS 2-1/2 (DN 65) and larger.
3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.

5. Perforation Size:
 - a. Strainers NPS 2 (DN 50) and Smaller: 0.020 inch.
 - b. Strainers NPS 2-1/2 to NPS 4 (DN 65 to DN 100): 0.045 inch.
6. Drain: Pipe plug or Factory-installed, hose-end drain valve.

2.3 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 (DN 20).
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 (DN 20).
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 (DN 20) threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 (DN 6) side outlet with cap.

2.4 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 (DN 10) or NPS 1/2 (DN 15)] minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents <Insert drawing designation if any>:

1. Body: Stainless steel.
2. Pressure Rating: 150-psig minimum pressure rating.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 (DN 10) minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.5 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) 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, non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.6 WALL HYDRANTS

- A. Non-Freeze Wall Hydrants: Refer to schedule on Drawing P6.03.
- B. 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:
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Josam Company.
 2. MIFAB, Inc.
 3. Prier Products, Inc.
 4. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 5. Tyler Pipe; Wade Div.
 6. Watts Drainage Products Inc.
 7. Woodford Manufacturing Company.
 8. Zurn Plumbing Products Group; Light Commercial Operation.
 9. Zurn Plumbing Products Group; Specification Drainage Operation.
 10. Or approved equal.
- D. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
- E. Pressure Rating: 125 psig.
- F. Operation: Loose key.
- G. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
- H. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
- I. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
- J. Box: Deep, flush mounting with cover.
- K. Box and Cover Finish: Chrome plated.

- L. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
- M. Nozzle and Wall-Plate Finish: Rough bronze.
- N. Operating Keys(s): Two (2) with each wall hydrant.

2.7 WATER HAMMER ARRESTERS

- A. Water Hammer Arresters: Refer to schedule on Drawing P6.03.
- B. 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:
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AMTROL, Inc.
 - 2. Josam Company.
 - 3. MIFAB, Inc.
 - 4. PPP Inc.
 - 5. Sioux Chief Manufacturing Company, Inc.
 - 6. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - 7. Tyler Pipe; Wade Div.
 - 8. Watts Drainage Products Inc.
 - 9. Zurn Plumbing Products Group; Specification Drainage Operation.
 - 10. Or approved equal.
- D. Standard: ASSE 1010 or PDI-WH 201.
- E. Type: [Metal bellows] [Copper tube with piston].
- F. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.8 TRAP-SEAL PRIMER VALVES

- A. Supply-Type, Trap-Seal Primer Valves: Refer to schedule on Drawing P6.03.
- B. 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:
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. MIFAB, Inc.
 - 2. PPP Inc.
 - 3. Sioux Chief Manufacturing Company, Inc.
 - 4. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - 5. Watts Industries, Inc.; Water Products Div.
 - 6. Or approved equal.
- D. Standard: ASSE 1018.
- E. Pressure Rating: 125 psig minimum.
- F. Body: Bronze.

- G. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
- H. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
- I. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.9 TRAP-SEAL PRIMER SYSTEMS

- A. Trap-Seal Primer Systems: Refer to schedule on Drawing P6.03.
- B. 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:
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- D. Basis-of-Design Product: Subject to compliance with requirements or a comparable product by one of the following:
 - 1. PPP Inc.
 - 2. Standard: ASSE 1044,
 - 3. Piping: NPS 3/4, ASTM B 88, Type L (DN 20, ASTM B 88M, Type B); copper, water tubing.
 - 4. Cabinet: Recessed-mounting steel box with stainless-steel cover.
 - 5. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
 - 6. Vacuum Breaker: ASSE 1001.
 - 7. Number Outlets: As needed.
 - 8. Size Outlets: NPS 1/2 (DN 15).
 - 9. Or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Revise remaining paragraphs and subparagraphs in this Article to include specific installation requirements.
- B. Install water control valves with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- C. Install balancing valves in locations where they can easily be adjusted.
- D. Install outlet boxes recessed in wall. Install 2-by-4-inch fire-retardant-treated-wood blocking wall reinforcement between studs. Fire-retardant-treated-wood blocking is specified in Division 6 Section "Rough Carpentry."
- E. Water hammer arresters in first paragraph below are best shown on water risers and details. Specifying number, size, and location here is difficult.
- F. Install water hammer arresters in water piping according to PDI-WH 201.
- 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 drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

- J. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of piping and specialties.

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. Outlet boxes.
 - 2. Supply-type, trap-seal primer valves.
 - 3. Trap-seal primer systems.
- 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 23 Section "Mechanical Identification."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
 - 1. Test each system 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 flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 221119

SECTION 221316 – 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following for soil, waste, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.
 - 3. Encasement for underground metal piping.

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.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures" and International Building Code – New Jersey Edition – Latest Edition

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings:
 - 1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.
 - 2. Sovent Drainage System: Include plans, elevations, sections, and details.
- C. Field quality-control inspection and test reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy class(es).
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, hemp fiber.

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Solvent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.
- C. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - 1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.
 - a. Manufacturers:
 - 1) ANACO.
 - 2) Fernco, Inc.
 - 3) Ideal Div.; Stant Corp.
 - 4) Mission Rubber Co.
 - 5) Tyler Pipe; Soil Pipe Div.
 - 6) Charlotte Pipe & Foundry Co.
 - 2. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
 - a. Manufacturers:
 - 1) ANACO.
 - 2) Clamp-All Corp.

- 3) Ideal Div.; Stant Corp.
- 4) Mission Rubber Co.
- 5) Tyler Pipe; Soil Pipe Div.
- 6) Charlotte Pipe & Foundry Co.
3. Heavy-Duty, Shielded, Cast-Iron Couplings: ASTM A 48/A 48M, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve.
 - a. Manufacturers:
 - 1) MG Piping Products Co.

2.5 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- B. Hard Copper Tube: ASTM B 88, Types L (ASTM B 88M, Types B and C), water tube, drawn temper.
 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 2. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 3. 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.
- C. Soft Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B), water tube, annealed temper.
 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2.6 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
 1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Solvent Cement: ASTM D 2564.
 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 SPECIAL PIPE FITTINGS

- A. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Manufacturers:
 - a. Cascade Waterworks Mfg. Co.
 - b. Mission Rubber Co.
- B. Pressure Pipe Couplings: AWWA C219 metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
 - 1. Manufacturers:
 - a. Cascade Waterworks Mfg. Co.
 - b. Dresser, Inc.; DMD Div.
 - c. EBAA Iron Sales, Inc.
 - d. Ford Meter Box Company, Inc. (The); Pipe Products Div.
 - e. JCM Industries, Inc.
 - f. Romac Industries, Inc.
 - g. Smith-Blair, Inc.
 - h. Viking Johnson.
 - 2. Center-Sleeve Material: Manufacturer's standard.
 - 3. Gasket Material: Natural or synthetic rubber.
 - 4. Metal Component Finish: Corrosion-resistant coating or material.
- C. Flexible Ball Joints: Ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include gasketed ball-joint section and ductile-iron gland, rubber gasket, and steel bolts.
 - 1. Manufacturers:
 - a. EBAA Iron Sales, Inc.
- D. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - 1. Manufacturers:
 - a. EBAA Iron Sales, Inc.
 - b. Romac Industries, Inc.
 - c. Star Pipe Products; Star Fittings Div.
- E. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - 1. Manufacturers:
 - a. SIGMA Corp.

2.8 ENCASEMENT FOR UNDERGROUND METAL PIPING

- A. Description: ASTM A 674 or AWWA C105, high-density, crosslaminated PE film of 0.004-inch minimum thickness.
- B. Form: Sheet or tube.
- C. Color: Black.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground, soil and waste piping (EXCEPT IN THE KITCHEN) shall be any of the following:
 - 1. Hubless cast-iron soil pipe and fittings and couplings; and hubless-coupling joints.
 - 2. Copper DWV tube, copper drainage fittings, and soldered joints.
 - 3. Solid-Wall Schedule 40 PVC Pipe with primed & cemented PVC socket fittings.
- C. Aboveground, soil and waste piping NPS 5 (DN 125) (EXCEPT IN THE KITCHEN) and larger shall be any of the following:
 - 1. Hubless cast-iron soil pipe and fittings shielded, stainless-steel couplings; and hubless-coupling joints.
 - 2. Solid-Wall Schedule 40 PVC Pipe with primed & cemented PVC socket fittings.
- D. Aboveground, vent piping NPS 4 (DN 100) and smaller shall be any of the following:
 - 1. Hubless cast-iron soil pipe and fittings shielded, stainless-steel couplings; and hubless-coupling joints.
 - 2. Solid-Wall Schedule 40 PVC Pipe with primed & cemented PVC socket fittings.
- E. Aboveground, vent piping NPS 5 (DN 125) and larger shall be any of the following:
 - 1. Hubless cast-iron soil pipe and fittings shielded, stainless-steel couplings; and hubless-coupling joints.
 - 2. Solid-Wall Schedule 40 PVC Pipe with primed & cemented PVC socket fittings.
- F. Underground, soil, waste, and vent piping NPS 4 (DN 100) (EXCEPT IN THE KITCHEN) and smaller shall be any of the following:
 - 1. Service class, cast-iron bell and spigot type soil pipe with gasketed joints.
 - 2. Solid-Wall PVC Pipe with primed & cemented PVC socket fittings.
- G. Underground, soil and waste piping NPS 5 (DN 125) and larger shall be any of the following:
 - 1. Service class, cast-iron bell and spigot type soil pipe with gasketed joints.
 - 2. Solid-Wall PVC Pipe with primed & cemented PVC socket fittings.
- H. Aboveground, waste piping in the Kitchen shall be:

1. Hubless cast-iron soil pipe and fittings shielded, stainless-steel couplings; and hubless-coupling joints.
- I. Aboveground, vent piping in the Kitchen shall be:
 1. Hubless cast-iron soil pipe and fittings shielded, stainless-steel couplings; and hubless-coupling joints.
 2. Solid-Wall PVC Pipe with primed & cemented PVC socket fittings.
- J. Underground, waste, and vent piping in the Kitchen shall be ONLY:
 1. Service class, cast-iron bell and spigot type soil pipe with gasketed joints.

3.2 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 22 Section 220501
- B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section 220501
- D. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.
- E. 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."
 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.
- F. 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 2 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.
- G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- H. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

I. Install engineered soil and waste drainage and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Solvent Drainage System: Comply with ASSE 1043 and solvent fitting manufacturer's written installation instructions.
3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

K. Install ABS soil and waste drainage and vent piping according to ASTM D 2661.

L. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section 220501

B. 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.

C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

D. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.4 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 22 Section "Valves."

3.5 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 22 Section "Vibration Controls and Seismic Restraints."

B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:
 - 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. Install supports according to Division 22 Section "Hangers and Supports."
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- F. 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 (DN 40 and DN 50): 60 inches with 3/8-inch rod.
 2. NPS 3 (DN 80): 60 inches with 1/2-inch rod.
 3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches with 5/8-inch rod.
 4. NPS 6 (DN 150): 60 inches with 3/4-inch rod.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4 (DN 32): 84 inches with 3/8-inch rod.
 2. NPS 1-1/2 (DN 40): 108 inches with 3/8-inch rod.
 3. NPS 2 (DN 50): 10 feet with 3/8-inch rod.
 4. NPS 2-1/2 (DN 65): 11 feet with 1/2-inch rod.
 5. NPS 3 (DN 80): 12 feet with 1/2-inch rod.
 6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet with 5/8-inch rod.
 7. NPS 6 (DN 150): 12 feet with 3/4-inch rod.
- I. Install supports for vertical steel piping every 15 feet.
- J. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 2 (DN 50): 84 inches with 3/8-inch rod.
 2. NPS 3 (DN 80): 96 inches with 1/2-inch rod.
 3. NPS 4 (DN 100): 108 inches with 1/2-inch rod.
 4. NPS 6 (DN 150): 10 feet with 5/8-inch rod.
- K. Install supports for vertical stainless-steel piping every 10 feet.
- L. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4 (DN 32): 72 inches with 3/8-inch rod.
 2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches with 3/8-inch rod.
 3. NPS 2-1/2 (DN 65): 108 inches with 1/2-inch rod.
 4. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet with 1/2-inch rod.
 5. NPS 6 (DN 150): 10 feet with 5/8-inch rod.
- M. Install supports for vertical copper tubing every 10 feet.

- N. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 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: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

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

- 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.

END OF SECTION 221316

SECTION 221319 – 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 drainage piping specialties:
 - 1. Cleanouts.
 - 2. Floor drains.
 - 3. Miscellaneous drainage piping specialties.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. FOG: Fats, oils, and greases.
- C. FRP: Fiberglass-reinforced plastic.
- D. HDPE: High-density polyethylene plastic.
- E. PE: Polyethylene plastic.
- F. PP: Polypropylene plastic.
- G. PUR: Polyurethane plastic.
- H. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- B. Manufacturer Seismic Qualification Certification: Submit certification that all accessories, and components will withstand seismic forces defined in Division 22 Section "Plumbing Vibration and Seismic Controls." Include the following:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

- a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- 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. 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.
- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary and storm piping specialty components.

1.6 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate size and location of roof penetrations.

1.7 EXTRA MATERIALS

- 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. Cultures: Provide 1-gal. bottles of bacteria culture recommended by manufacturer of FOG disposal systems equal to 200 percent of amount installed, but no fewer than 2 1-gal. bottles.

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Metal Floor Cleanouts:
 - 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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated or a comparable product by one of the following:
 - a. MIFAB, Inc.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Tyler Pipe; Wade Div.
 - d. Watts Drainage Products Inc.
 - e. Or approved equal.

B. Stainless Steel Wall Cleanouts:

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated or a comparable product by one of the following:
 - a. MIFAB, Inc.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Tyler Pipe; Wade Div.
 - d. Watts Drainage Products Inc.
 - e. Or approved equal.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated or a comparable product by one of the following:
 - a. MIFAB, Inc.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Tyler Pipe; Wade Div.
 - d. Watts Drainage Products Inc.
 - e. Or approved equal.
4. Standard: ASME A112.6.3 with backwater valve.
5. Pattern: Floor drain.
6. Outlet: Side.
7. Sediment Bucket: Refer to plumbing schedule.
8. Top or Strainer Material: Bronze.
9. Top of Body and Strainer Finish: Nickel bronze.
10. Top Shape: Round.

2.3 MISCELLANEOUS DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
 2. Size: Same as connected waste piping [with increaser fitting of size indicated].
- B. Deep-Seal Traps:
1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
 2. Size: Same as connected waste piping.
 - a. NPS 2 (DN 50): 4-inch minimum water seal.
 - b. NPS 2-1/2 (DN 65) and Larger: 5-inch minimum water seal.
- C. 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 (DN 15) side inlet.
- D. Air-Gap Fittings:
1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
 2. Body: Bronze or cast iron.
 3. Inlet: Opening in top of body.
 4. Outlet: Larger than inlet.
 5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.
- E. Sleeve Flashing Device:
1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend [1 inch (25 mm)] [2 inches (51 mm)] <Insert dimension> above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
 2. Size: As required for close fit to riser or stack piping.
- F. 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.
- G. 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.
- H. Frost-Resistant Vent Terminals:
1. Description: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.

2. Design: To provide 1-inch (25-mm) enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

I. 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.

J. Downspout Boots:

1. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 (DN 100) outlet; and shop-applied bituminous coating.
2. Size: Inlet size to match downspout.
3. Description: ASTM A 74, Service class, hub-and-spigot, cast-iron soil pipe.
4. Size: Same as or larger than connected downspout.

K. Conductor Nozzles:

1. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.
2. Size: Same as connected conductor.

2.4 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.
2. Vent Pipe Flashing: 8 oz./sq. ft.

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 (Z275) 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section 220501 for piping joining materials, joint construction, and basic installation requirements.

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.

3.3 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 221319

SECTION 224100 – PLUMBING FIXTURES

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. Faucets.
 - 2. Lavatories.
 - 3. Kitchen sinks.
 - 4. Water closets.
 - 5. Toilet seats.
 - 6. Supply fittings.
 - 7. Waste fittings.

- B. Related Requirements:

- 1. Section 224213 "Commercial Water Closets."

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 lavatories.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For plumbing fixtures and faucets to include in emergency, operation, and operation and maintenance manuals.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures of unit shell.
 - b. Faulty operation of controls, blowers, pumps, heaters, and timers.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Applications of Shells: Five years from date of Substantial Completion.
 - 3. Warranty Period for Applications of Electronic Controls: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 REFER TO THE PLUMBING FIXTURE SCHEDULE FOR MAKE AND MODELS OF ALL FIXTURES.

2.2 GROUT

- A. Standard: ASTM C 1107/C 1107M, 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 (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

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 plumbing-fixture installation.
- B. Examine walls, floors, cabinets, and counters for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install plumbing fixtures level and plumb according to roughing-in drawings.
- B. Install floor-mounted water closets on closet flange attachments to drainage piping.
- C. Install counter-mounting fixtures in and attached to casework.

- D. Install pedestal lavatories on pedestals and secured to wood blocking in wall.
- E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 - 1. Exception: Use ball or gate valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 220523.
- F. Install toilet seats on water closets.
- G. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- H. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- I. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes unless otherwise indicated.
- J. Set shower receptors in leveling bed of cement grout.
- K. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."
- L. 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."
- M. Seal joints between plumbing fixtures, 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."

3.3 CONNECTIONS

- A. Connect fixtures 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."
- D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.4 ADJUSTING

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.
- B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224100

SECTION 230000 – MECHANICAL SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - a. Work covered under Mechanical Contract.
 - b. Work under other contracts.
 - c. Use of premises.
 - d. Owner's occupancy requirements.
 - e. Specification formats and conventions.

- B. Related Sections include the following:

- a. Division 23 Sections.

1.3 WORK COVERED UNDER MECHANICAL CONTRACT

- A. Provide all labor, materials, tools, machinery, equipment, and services necessary to complete the mechanical work under this contract. All systems and equipment shall be complete in every aspect and all items of material, equipment, and labor shall be provided for a fully operational system. Coordinate the work with work of other trades so as to resolve conflicts without impeding job progress. The mechanical work includes the following:

- B. MECHANICAL

- 1. The mechanical contractor shall furnish all labor, materials, equipment, rigging, appliances, tools and accessories required for providing, installing, connecting and testing the new mechanical system, associated work, controls, etc., in accordance with these specifications and the applicable drawings. The work includes:
 - a. Furnish and install new HV/HVAC mechanical equipment as scheduled on the plans, complete with new ductwork, piping, controls, electrical, etc. for a complete and operational system.
 - b. Furnish and install new split-DX, Gas fired system as scheduled on the plans, complete with indoor and outdoor units, refrigerant piping, condensate drain piping, condensate pumps, insulation of all piping/ductwork, controls, electrical, etc. for a complete and operational system

- c. Furnish and install new electric cabinet heater, complete with wiring, thermostats, disconnect switches, etc. for a complete and operational system. Color to be selected by the owner
- d. Furnish and install new exhaust fans complete with supports, vibration isolators, fan switch, interlock wiring, backdraft dampers, etc. for a complete and operational system.
- e. All electrical work associated with new HV/HVAC system shall be performed by the Electrical Subcontractor. Refer to electrical drawings and Division 26 specification sections for information.
- f. Furnish and install new supply, return, exhaust and outdoor air ductwork as indicated on the drawings. All ductwork shall be galvanized steel construction.
- g. Provide high-efficiency electric motors for all new units.
- h. Furnish and install, volume dampers.
- i. Furnish and install flexible duct connectors at all duct connections to all HV/HVAC units.
- j. Provide fire stopping for all duct and piping penetrations through rated walls/slabs with pipe escutcheons
- k. All cutting, patching and alteration work shall be performed.
- l. All ductwork shall be properly fabricated, installed and supported as per SMACNA and ASHRAE guidelines
- m. Contractor to perform testing, adjusting and balancing (TAB) of the entire HV/HVAC system shown on the drawings, including all new HV/HVAC units, air outlets/inlets, etc. Submit four (4) sets of air and unit TAB reports for review.
- n. Provide testing, commissioning and start-up reports for all new mechanical/HV system installed in this project.
- o. Contractor to prepare as-built drawings of the entire mechanical/HV system. Submit four (4) sets of Operation and Maintenance Manuals.
- p. Provide color coded identification tags, identification markers and equipment tags for all equipment including HV/HVAC units, fans, ductwork, control valves, etc.
- q. Warranty: The entire system shall be warranted for a period of two (2) complete years from the date of acceptance by the owner, including all materials and labor components.
- r. Commissioning: The following is the commissioning scope of work for this project:

1. There will not be a separate commissioning agent on this project. The architect/engineer will oversee the commissioning process.
2. Submittals/Shop Drawings shall include detailed start up procedures.
3. All equipment shall be factory tested before being shipped to project site.
4. Perform functional performance test (FPT) of all HV/HVAC systems and equipment. Submit FPT Reports.
5. Provide detailed Start-Up Reports.
6. Trending: The building control system/energy management system, shall be monitored for the first year by the Controls Contractor, as well as by the Owner/Owner designated team for proper operation to optimize energy performance without compromising the comfort conditions.
7. The contractor shall certify in writing that the entire work was completed and systems are operational according to the contract documents, including calibration of instrumentation and controls.
8. Schedule, witness and document tests, inspections and systems startup. Inform architect/engineer sufficiently in advance to enable them to witness startup.
9. Perform testing, adjusting and balancing of all airside, waterside, and units/systems.
10. Compile test data, inspection reports and certificates and include them in the Systems Manual and Commissioning Report.
11. Certify date of acceptance and startup for each item of equipment for start of warranty periods.
12. Prepare as-built drawings. Submit four (4) sets of each, along with two (2) CD's (for drawings).
13. Submit six (6) sets of all documents.

1.4 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

1.5 USE OF PREMISES

- A. General: Each Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - a. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.

- b. Driveways and Entrances: Keep driveways parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.6 OWNER'S OCCUPANCY REQUIREMENTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.
 - a. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - b. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
 - a. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
 - b. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
 - c. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed.

1.7 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat" numbering system.
 - a. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 - b. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - a. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate.

Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

- b. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.8 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 230000

SECTION 230500 – COMMON WORK RESULTS 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. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Mechanical sleeve seals.
 - 5. Sleeves.
 - 6. Escutcheons.
 - 7. Grout.
 - 8. Equipment installation requirements common to equipment sections.
 - 9. Painting and finishing.
 - 10. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- D. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures.
- E. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Transition fittings.
 - 2. Dielectric fittings.
 - 3. Mechanical sleeve seals.

4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. 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.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

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 manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, **1/8-inch** maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, **1/8 inch** thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for **250-psig** minimum working pressure at **180 deg F**.
 - 1. Acceptable Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Eclipse, Inc.
 - c. Epco Sales, Inc.
 - d. Hart Industries, International, Inc.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Industries, Inc.; Wilkins Div.

- g. Or Approved Equal.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
 - 1. Acceptable Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Epco Sales, Inc.
 - c. Watts Industries, Inc.; Water Products Div.
 - d. Or Approved Equal.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Acceptable Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Pipeline Seal and Insulator, Inc.
 - d. Or Approved Equal.
 - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
 - 1. Acceptable Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.
 - c. Epco Sales, Inc.
 - d. Or Approved Equal.
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
 - 1. Acceptable Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.
 - d. Victaulic Co. of America.
 - e. Or Approved Equal.

2.5 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Acceptable Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - e. Or Approved Equal.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped and smooth-outer surface with nailing flange for attaching to wooden forms.

2.7 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 1. Finish: Polished chrome-plated and rough brass.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 1. Finish: Polished chrome-plated and rough brass.

- E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.8 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi , 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" for general demolition requirements and procedures.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping 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. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
 - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
 - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-rivet hinge and set screw or spring clips.
 - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
 - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
 - l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
 - 2. Existing Piping: Use the following:
 - a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-rivet hinge and spring clips.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and spring clips.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.
 - g. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated finish.
 - h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge and set screw or spring clips.
 - i. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
 - j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with set screw or spring clips.
 - k. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.
- L. Sleeves are not required for core-drilled holes.
- M. Permanent sleeves are not required for holes formed by removable PE sleeves.

- N. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas **2 inches** above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Install sleeves that are large enough to provide **1/4-inch** annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. PVC Pipe Sleeves: For pipes smaller than **NPS 6**.
 - b. Steel Sheet Sleeves: For pipes **NPS 6** and larger, penetrating gypsum-board partitions.
- P. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using 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.
 - 1. Install steel pipe for sleeves smaller than **6 inches** in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves **6 inches** and larger in diameter.
 - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- Q. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for **1-inch** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
- S. Verify final equipment locations for roughing-in.
- T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. 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.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.4 PIPING CONNECTIONS

- A. 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. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

- A. Painting of mechanical systems, equipment, and components is specified in Division 09 Sections "Interior Painting".
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

3.8 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout around anchors.
- G. Cure placed grout.

END OF SECTION 230500

SECTION 230513 – COMMON MOTOR REQUIREMENTS FOR HVAC 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 general requirements for single phase and polyphase, general purpose, horizontal, small and medium, squirrel cage induction motors for use on ac power systems up to 600V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.
- C. Comply with IEEE 841 for severe duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.

- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random wound, squirrel cage.
- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F.
- J. Code Letter Designation:
 - 1. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse width modulated inverters.
 - 2. Energy and Premium Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent split capacitor.
 - 2. Split phase.

- 3. Capacitor start, inductor run.
- 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable torque, permanent split capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

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 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: Signed and sealed by a qualified professional engineer. 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.
 - 5. 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: Pre-galvanized 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.

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. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig (688-kPa) ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or [ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) 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 (50 mm) 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] [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.

2.5 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. 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.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

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 (34.5-MPa), 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. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) 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.
- F. 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.
- G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- I. 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.
- J. Install lateral bracing with pipe hangers and supports to prevent swaying.
- K. 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 (DN 65) 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.
- L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- M. 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.
- N. 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 (DN 100) 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 (DN 100) 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 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
 - d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
 - e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
- 5. Pipes NPS 8 (DN 200) 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 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 (40 mm).

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 (0.05 mm).
- B. 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 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, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper 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 (DN 15 to DN 750).
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), 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 (DN 20 to DN 200).
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
 - 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
 - 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 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 (DN 100 to DN 900), 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 (DN 100 to DN 900), 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 (DN 65 to DN 900) 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 (DN 25 to DN 750), 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 (DN 65 to DN 600), 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 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- 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 (DN 24 to DN 600).
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) 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 (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) 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 (49 to 232 deg C) 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 (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
 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:
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 (32 mm).
 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 powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230553 – MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following mechanical identification materials and their installation:
 - 1. Equipment nameplates.
 - 2. Equipment markers.
 - 3. Equipment signs.
 - 4. Access panel and door markers.
 - 5. Pipe markers.
 - 6. Duct markers.
 - 7. Stencils.
 - 8. 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. Valve numbering scheme.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 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 location of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
 - 1. Data:
 - a. Manufacturer, product name, model number, and serial number.
 - b. Capacity, operating and power characteristics, and essential data.
 - c. Labels of tested compliances.
 - 2. Location: Accessible and visible.
 - 3. Fasteners: As required to mount on equipment.
- B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
 - 1. Terminology: Match schedules as closely as possible.
 - 2. Data:
 - a. Name and plan number.
 - b. Equipment service.
 - c. Design capacity.
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
 - 3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
- C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
 - 1. Data: Instructions for operation of equipment and for safety procedures.
 - 2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
 - 3. Thickness: 1/8 inch, unless otherwise indicated.
 - 4. Thickness: 1/16 inch for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
 - 5. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.
- D. Access Panel and Door Markers: 1/16-inch thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.
 - 1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.2 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.
 2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
 3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
 4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
 5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Pre-tensioned Pipe Markers: Precoiled semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.
- C. Shaped Pipe Markers: Preformed semi-rigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.
- D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.
- E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive, permanent-type, self-adhesive back.
1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
 2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

2.3 DUCT IDENTIFICATION DEVICES

- A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

2.4 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door markers, equipment markers, equipment signs, and similar operational instructions.
1. Stencil Material: Metal or fiberboard, Aluminum, or Brass.
 2. Stencil Paint: Exterior, gloss, acrylic enamel black, unless otherwise indicated. Paint may be in pressurized spray-can form.
 3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1, unless otherwise indicated.

2.5 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme approved by Architect. Provide 5/32-inch hole for fastener.

1. Material: 0.032-inch thick brass or aluminum.
2. Material: 0.0375-inch thick stainless steel.
3. Material: 3/32-inch thick laminated plastic with 2 black surfaces and white inner layer.
4. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

2.6 VALVE SCHEDULES

- A. Valve Schedules: For each piping system, on standard-size 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-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.
 2. Frame: Extruded aluminum.
 3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

2.7 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 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 23 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
 1. Fuel-burning units, including boilers, furnaces, heaters, and stills.
 2. Heat exchangers, coils, evaporators, and similar equipment.
 3. Fans, blowers, primary balancing dampers, and mixing boxes.
 4. Packaged HV/HVAC (central-station and zone-type units), split HV/HVAC, indoor AHU's, etc.

- B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
1. Letter Size: Minimum 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.
 2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
 3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
 - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
 - b. Meters, gages, thermometers, and similar units.
 - c. Fuel-burning units, including boilers, furnaces, and heaters.
 - d. Heat exchangers, coils, and similar equipment.
 - e. Fans, blowers, primary balancing dampers, and mixing boxes.
 - f. Packaged HV/HVAC (central-station and zone-type units), split HV/HVAC, indoor AHU's, etc.
 - g. Strainers, filters, water-treatment systems, and similar equipment.
- C. Stenciled Equipment Marker Option: Stenciled markers may be provided instead of laminated-plastic equipment markers, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.
- D. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.
1. Identify mechanical equipment with equipment markers in the following color codes:
 - a. Green: For cooling equipment and components.
 - b. Yellow: For heating equipment and components.
 - c. Green and Yellow or Orange: For combination cooling and heating equipment and components.
 2. Letter Size: Minimum 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.
 3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
 4. Include signs for the following general categories of equipment:
 - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
 - b. Fuel-burning units, including boilers, furnaces, and heaters.
 - c. Pumps and similar motor-driven units.
 - d. Heat exchangers, coils, evaporators, and similar equipment.
 - e. Fans, blowers, primary balancing dampers, and mixing boxes.
 - f. Packaged HV/HVAC (central-station and zone-type units), split HV/HVAC, indoor AHU's, etc.
 - g. Strainers, filters, water-treatment systems, and similar equipment.

- E. Stenciled Equipment Sign Option: Stenciled signs may be provided instead of laminated-plastic equipment signs, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.
- F. Install access panel markers with screws on equipment access panels.

3.3 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
 - 1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.
 - 2. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape at least 3/4 inch wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
- B. Stenciled Pipe Marker Option: Stenciled markers may be provided instead of manufactured pipe markers, at Installer's option. Install stenciled pipe markers with painted, color-coded bands or rectangles complying with ASME A13.1 on each piping system.
 - 1. Identification Paint: Use for contrasting background.
 - 2. Stencil Paint: Use for pipe marking.
- C. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed 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 nonaccessible 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 markers.

3.4 DUCT IDENTIFICATION

- A. Install duct markers with permanent adhesive on air ducts in the following color codes:
 - 1. Green: For cold-air supply ducts.
 - 2. Yellow: For hot-air supply ducts.
 - 3. Blue: For exhaust, outside, relief, return, and mixed-air ducts.
 - 4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
 - 5. Letter Size: Minimum 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.

- B. Stenciled Duct Marker Option: Stenciled markers, showing service and direction of flow, may be provided instead of laminated-plastic duct markers, at Installer's option, if lettering larger than 1-inch high is needed for proper identification because of distance from normal location of required identification.
- C. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

3.6 ADJUSTING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.7 CLEANING

- A. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION 230553

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.
 - 2. Additional Tests
 - a. Sound testing.
 - b. Vibration testing.
 - c. Duct leakage testing.
 - d. Controls verification.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. T&B: Testing, adjusting, and balancing
- C. T&B Agency: An independent entity certified by AABC to perform testing and balancing work.
- D. TBE: AABC certified test and balance engineer.
- E. TBT: AABC certified test and balance technician.
- F. HVAC: Heating, ventilating, and air conditioning.
- G. BAS: Building automation systems.
- H. Contract documents: the mechanical drawings and test and balance specification
- I. NC: noise criteria
- J. RC: room criteria

1.4 T&B INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation T&B of AABC certification of T&B agency and personnel, including a sample copy of the AABC "National Performance Guaranty." If not submitted within the timeframe specified, the engineer has the right to choose an AABC agency at the Contractor's expense.
- B. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit T&B strategies and step-by-step procedures as specified in "Preparation" Article.
- C. System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article to be used and filled out by systems Installers verifying that systems are ready for T&B.
- D. Examination Report: Within 30 days of Contractor's Notice to Proceed, provide a summary report of the examination review required in Part 3 "Examination", if issues are discovered that may preclude the proper testing and balancing of the systems.
- E. Certified T&B reports: Within 14 days of completion of balancing work, submit AABC-certified T&B report.
 - 1. Submit one copy of the final T&B Report directly to the design professional of record. Provide five additional copies to the contractor.

1.5 QUALITY ASSURANCE

- A. T&B Agency Qualifications: Engage a T&B entity certified by AABC.
 - 1. T&B Field Supervisor: Employee of the T&B Agency who is certified by AABC.
 - 2. T&B Technician: Employee of the T&B Agency and who is certified by AABC as a TBT.
- B. T&B Conference: If requested by the Engineer or Owner after approval of the T&B Agency's submittals, meet to develop a mutual understanding of the details. The T&B agency shall be provided a minimum of 14 days' advance notice of scheduled meeting time and location.
 - 1. Agenda Items:
 - a. The examination report.
 - b. The Strategies and Procedures plan.
 - c. Systems readiness checklists.
 - d. Coordination and cooperation of trades and subcontractors.
 - e. Coordination of documentation and communication flow.
- C. TBT shall perform the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified T&B reports.
 - 2. Certify that the T&B team complied with the approved T&B plan and the procedures specified and referenced in this Specification.
 - 3. Certify the T&B report.
- D. T&B Report Forms: Use approved forms submitted with the Strategies and Procedures Plan.

- E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in the "AABC National Standards for Total System Balance."

1.6 PROJECT CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire T&B period. Cooperate with Owner during T&B 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 T&B operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 T&B AGENCY

- A. Subject to compliance with requirements, engage one of AABC certified T&B Agencies:

3.2 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper T&B of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Note the locations of devices that are not accessible for testing and balancing.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- E. Examine equipment performance data including fan and pump curves.
- F. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, clean permanent filters are installed, and equipment with functioning controls is ready for operation.
- G. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected, configured by the controls contractor, and functioning.
- H. Examine strainers to verify that mechanical contractor has replaced startup screens with permanent screens and that all strainers have been cleaned.
- I. Examine two-way valves for proper installation and function.

- J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- K. Examine air vents to verify that mechanical contractor has removed all air from all hydronic systems.

3.3 PREPARATION

- A. Prepare a T&B 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. Prepare system-readiness checklists, as described in the "AABC National Standards for Total System Balance," for use by systems installers in verifying system readiness for T&B. These shall include, at a minimum, the following:
 - 1. Airside:
 - a. Ductwork is complete with terminals installed.
 - b. Volume, smoke and fire dampers are open and functional.
 - c. Clean filters are installed.
 - d. Fans are operating, free of vibration, and rotating in correct direction.
 - e. Variable-frequency controllers' start-up is complete and safeties are verified.
 - f. Automatic temperature-control systems are operational.
 - g. Ceilings are installed.
 - h. Windows and doors are installed.
 - i. Suitable access to balancing devices and equipment is provided.

3.4 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" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for T&B procedures.
- 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.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain approved submittals and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare single-line schematic diagram of systems for the purpose of identifying HVAC components.

- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- E. Verify that motor starters are equipped with properly sized thermal protection.
- F. Check condensate drains for proper connections and functioning.
- G. Check for proper sealing of air-handling-unit components.

3.6 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 any artificial loading of filters at the time static pressures are measured.
 - 3. 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 will occur. 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 sub-main and branch duct volume dampers for specified airflow.
Re-measure each sub-main 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 airflow at all inlets and outlets.
 - 3. Adjust each inlet and outlet for specified airflow.
 - 4. Re-measure each inlet and outlet after all have been adjusted.

D. Verify final system conditions.

1. Re-measure and confirm minimum outdoor air, return and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm total airflow is within design.
3. Re-measure all final fan operating data, rpms, volts, amps, 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.

3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils and heat exchangers. Obtain approved submittals and any manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.

B. Verify that hydronic systems are ready for testing and balancing:

1. Check liquid level in expansion tank.
2. Check that makeup water-has adequate pressure to highest vent.
3. Check that control valves are in their 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.

3.8 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. Phse/Hertz (Hz)
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 the manual bypass of the controller to prove proper operation.

3.9 TOLERANCES

A. Set HVAC system's air flow 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.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.10 FINAL TEST AND BALANCE REPORT

- A. The report shall be a complete record of the HVAC system performance, including conditions of operation, items outstanding, and any deviations found during the T&B process. The final report also provides a reference of actual operating conditions for the owner and/or operations personnel. All measurements and test results that appear in the reports must be made on site and dated by the AABC technicians or test and balance engineers.
- B. The report must be organized by systems and shall include the following information as a minimum:
 - 1. Title Page:
 - a. AABC certified company name
 - b. Company address
 - c. Company telephone number
 - d. Project identification number
 - e. Location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
 - i. Project number
 - j. Date of report
 - k. AABC Certification Statement
 - l. Name, signature, and certification number of AABC TBE
 - 2. Table of Contents.
 - 3. AABC National Performance Guaranty.
 - 4. Report Summary:
 - a. The summary shall include a list of items that do not meet design tolerances, with information that may be considered in resolving deficiencies.
 - 5. Instrument List:
 - a. Type.
 - b. Manufacturer.
 - c. Model.
 - d. Serial Number.
 - e. Calibration Date.
 - 6. T&B Data:
 - a. Provide test data for specific systems and equipment as required by the most recent edition of the "AABC National Standards."
- C. One copy of the final test and balance report shall be sent directly to the engineer of record. Provide five additional copies to the contractor.

3.11 VERIFICATION OF T&B REPORT

- A. Final Verification:

1. After testing and balancing is complete and accurately documented in the final report, request that a final verification be made by Engineer.
2. The T&B Agency shall conduct the verification in the presence of Engineer.
3. Engineer 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.
4. 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."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final verification, the testing and balancing shall be considered incomplete.

3.12 REVERIFICATION

- A. T&B Agency shall recheck all measurements and make adjustments as required to complete the balancing. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second verification.
- B. If the second verification also fails, Owner/Engineer may contact AABC Headquarters regarding the AABC National Performance Guaranty.

3.13 ADDITIONAL TESTS

A. Sound Testing

1. After the systems are balanced and the spaces are architecturally complete, read and record sound levels at 10 locations as designated by the Engineer of record.
2. Instrumentation:
 - a. The sound-testing meter shall be a portable, general-purpose testing meter consisting of a microphone, processing unit, and readout.
 - b. The sound-testing meter shall be capable of showing fluctuations at minimum and maximum levels, and measuring the equivalent continuous sound pressure level (LEQ).
 - c. The sound-testing meter must be capable of using 1/3 octave band filters to measure mid-frequencies from 31.5 HZ to 8000 HZ.
 - d. The accuracy of the sound-testing meter shall be ± 1 decibel.
3. Test Procedures
 - a. Perform test at the quietest background noise period. Note any cause of unpreventable sound that may affect the test outcome.
 - b. Equipment should be operating at design values.
 - c. Calibrate the sound-testing meter prior to taking measurements.
 - d. Use a microphone suitable for the type of noise levels measured that is compatible with the meter. Provide a windshield for outside or in-duct measurements.
 - e. Record a set of background measurements in dB(A), and sound pressure levels in the eight un-weighted octave bands [63 HZ to 8000 HZ (NC)] with the equipment off.
 - f. Take sound readings in dB(A), and sound pressure levels in the eight un-weighted octave bands [63 HZ to 8000 HZ (NC)] with the equipment on.

- g. Take readings no closer than 3' from a wall or from the operating equipment, and approximately 5' from the floor, with the meter held or mounted on a tripod.
 - h. For outdoor measurements, move the sound-testing meter slowly and scan the area that has the greatest exposure to the noise source being tested. (This type of reading is generally performed using the A-Weighted scale).
4. Reporting
- a. The report must record: the location, the system tested, the dB(A) reading, and the sound pressure level in each octave band with equipment on and off.
 - b. Plot all the sound pressure levels on the NC work sheet, with the equipment on and off.
- B. Vibration Testing:
- 1. After the systems are balanced and the spaces are architecturally complete, read and record vibration levels on all equipment with motor horsepower equal to or greater than 10 hp.
 - 2. Instrumentation:
 - a. The vibration meter should be portable, battery-operated, and microprocessor-controlled, with or without a built-in printer.
 - b. The meter shall automatically identify engineering units, filter bandwidth, amplitude and frequency scale values.
 - c. The meter shall be able to measure machine vibration displacement in mils of deflection, velocity in inches per second, and acceleration in inches per second squared.
 - 3. Test Procedures:
 - a. Verify that the vibration meter calibration date is current before taking readings.
 - b. To ensure accurate readings, verify that the accelerometer has a clean, flat surface and is mounted properly.
 - c. With the unit running, set up the vibration meter in a safe, secure location. Connect the transducer to the meter with the proper cables. Hold the magnetic tip of the transducer on top of the bearing, and measure the unit in mils of deflection. Record the measurement, then move the transducer to the side of the bearing, and record in mils of deflection. Record an axial reading in mils of deflection by holding the nonmagnetic, pointed transducer tip on the end of the shaft.
 - d. Change the vibration meter to velocity (inches per second) measurements. Repeat and record the above measurements.
 - e. Record the CPM or the RPM.
 - f. Read each bearing on the motor, fan, and/or pump as required. Track and record vibration levels from the rotating component through the casing to the base.
 - 4. Reporting
 - a. The report must record the location and the system tested.
 - b. Include horizontal-vertical-axial measurements for all tests.
 - c. Verify that vibration limits follow specifications, or, if not specified, follow the "General Machinery Vibration Severity Chart" or "Vibration Acceleration General Severity Chart" from the AABC National Standards. Acceptable levels of vibration are normally "Smooth" to "Good."
 - d. Include in the report the Machinery Vibration Severity Chart, with conditions plotted.

C. Duct Leakage Testing:

1. Witness the duct pressure testing performed by the mechanical/installing contractor.
2. Verify that proper test methods are used and that leakage rates are within specified tolerances.
3. Report any deficiencies observed.

D. Controls Verification

1. In conjunction with system balancing perform the following:
 - a. Work with the temperature control contractor to ensure the system is operating within the design limitations, and gain a mutual understanding of intended control performance.
 - b. Confirm that the sequences of operation are in compliance with the approved drawings.
 - c. Verify that controllers are calibrated and function as intended.
 - d. Verify that controller setpoints are as specified.
 - e. Verify the operation of lockout or interlock systems.
 - f. Verify the operation of all valve and damper actuators.
 - g. Verify that all controlled devices are properly installed and connected to the correct controller.
 - h. Verify that all controlled devices travel freely and are in the position indicated by the controller: open, closed, or modulating.
 - i. Verify the location and installation of all sensors to ensure they will sense only the intended temperatures, humidities, or pressures.
2. Reporting
 - a. The report shall include a summary of verifications performed, remaining deficiencies, and any variations from specified conditions.

END OF SECTION 230593

SECTION 230719 – 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 HVAC piping systems:
 - 1. Refrigerant Piping.

1.3 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.

1.4 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 and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 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.

1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC 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.
- C. Coordinate installation and testing of heat tracing.

1.7 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. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
 - 1. Prefabricated Fitting Covers: Comply with ASTM C 450 and ASTM C 585 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.
- C. 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. Block Insulation: ASTM C 552, Type I.
 - 2. Special-Shaped Insulation: ASTM C 552, Type III.
 - 3. Board Insulation: ASTM C 552, Type IV.
 - 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.
- D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, with factory-applied FSK jacket/FSP jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- E. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Type I, 850 deg F (454 deg C) 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.

- F. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory-applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.
- G. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ/FSK jacket complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. (40 kg/cu. m) or more. Thermal conductivity (k-value) at 100 deg F (55 deg C) is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 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 (minus 73 to plus 93 deg C).
 - 1. 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. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Phenolic and Polyisocyanurate Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F (minus 59 to plus 149 deg C).
 - 1. 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. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. 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).
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. 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. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- F. PVC Jacket Adhesive: Compatible with PVC jacket.
1. 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. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 4. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
 2. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
 3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 4. Color: White.
- D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 3. Solids Content: 60 percent by volume and 66 percent by weight.
 4. Color: White.

2.4 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
 3. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
 4. Color: White.

2.5 SEALANTS

- A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Permanently flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
 4. Color: White or gray.
 5. 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).
 6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
 4. Color: Aluminum.
 5. 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).
 6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
 4. Color: White.
 5. 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).
 6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
 5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perms) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Adhesive: As recommended by jacket material manufacturer.
 - 2. Color: Color-code jackets based on system.
 - 3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Width: 3 inches (75 mm).
 - 2. Thickness: 11.5 mils (0.29 mm).
 - 3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
 - 6. 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. Width: 3 inches (75 mm).
 - 2. Thickness: 6.5 mils (0.16 mm).
 - 3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
 - 6. 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. Width: 2 inches (50 mm).
 - 2. Thickness: 6 mils (0.15 mm).
 - 3. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
 - 4. Elongation: 500 percent.
 - 5. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 - 1. Width: 2 inches (50 mm).
 - 2. Thickness: 3.7 mils (0.093 mm).
 - 3. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
 - 4. Elongation: 5 percent.
 - 5. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.9 SECUREMENTS

- A. Bands:

1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) wide with [wing seal] [or] [closed seal].
 2. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.
- C. Wire: 0.080-inch (2.0-mm) nickel-copper alloy soft-annealed, galvanized steel.

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.
 3. 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. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F (0 and 149 deg C) with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. 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. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). 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 2 inches (50 mm) o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. 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. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
- C. Insulation Installation at Floor Penetrations:
 1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies.

3.5

3.6

3.7

3.8

3.9 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.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.10 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 (150 mm) 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 (25 mm), 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.

3.11 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 (150 mm) 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 (25 mm), 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.

3.12 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 (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- (1.6-mm-) 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 (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) 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 (25-mm) overlap at longitudinal seams and end joints; for horizontal applications. 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 (50-mm) 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 (300 mm) o.c. and at end joints.

3.13 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 Engineer, 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.

3.14 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. Below-grade piping.
 - 2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.15 INDOOR PIPING INSULATION SCHEDULE

- A. OUTDOOR, FIELD-APPLIED JACKET SCHEDULE
 - A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
 - B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Exposed:
 - 1. Aluminum, Smooth: 0.016 inch thick.

END OF SECTION 230719

SECTION 230993 – SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes control sequences for HVAC systems, subsystems, & equipment.

1.2 RELATED DOCUMENTS

- A. Drawings & general provisions of the Contract, including General and Supplementary Conditions & Division 01 Specification Sections, apply to this Section.

1.3 COORDINATED SEQUENCES & ATC DIAGRAMS

- A. Project ATC Diagrams: The Sequences of Operations detailed below are predicated on the specific Project ATC diagrams. Reference the ATC Diagrams for the Unit configuration, ATC control devices, point types & locations for each device.
- B. Control Sequence Descriptions: The control sequences below describe all necessary equipment operation including those operations that are provided by the HVAC Equipment Unit manufacturers (UM) & those as part of the Automatic Temperature Controls system (ATC). Due to the nature of the project, the control sequences will require field adjustment and modification. The ATC contractor shall provide all modifications to the sequences as requested by the MEP during the commissioning of the BMS.

1.4 RESPONSIBILITIES

- A. Automatic Temperature Control (ATC) Contractor's Responsibilities: The ATC contractor (ATC) shall provide, field install & wire all necessary software & hardware, wiring, & computing equipment in compliance with this specification. The ATC contractor shall also provide programming, interface design, startup services by competent technicians that regularly employed by the ATC contractor with full responsibility for proper operation of the control system including debugging & proper calibration of each component in the entire system. The ATC contractor (ATC) shall provide power supply wiring to all external control panels, actuators (valves, dampers, etc.), including low voltage transformers, including the power for devices required for operation of BACnet communication as provided as part of complete HVAC Equipment Unit Manufacturer provided BACnet packaged.

1.6 DX AC GAS FIRED UNITS

- A. The AC Monitoring Manufacturer (UM) shall provide a BACnet MS/TP communications card; all time to coordinate the integration to the BMS. The ATC contractor (ATC) shall provide the BACnet MS/TP communications wiring to the CRAC BACnet MS/TP communications board; provide all time to integrate the BACnet points.

- B. Scheduling: The AC Monitoring shall be enabled (ENABLE) from the BMS
- C. Control: A Unit manufacturer Temperature (TEMP) and Humidity (RH) sensors shall monitor and control the space conditions through the unit's own internal controls. A Liquid Detection sensor (LDS) mounted in the drip pan shall be hard-wired to shut down the HP/AC Monitoring upon detection of liquid.
- D. Operator and Graphical User Interface requirements: The Building Management System Control Diagrams and the tables below shall provide for Operator Control of the HVAC equipment through an accurate depiction of the devices within the unit, along with the I/O points, parameters and alarms shall be displayed on a customized 3-dimensional web-based graphic.

1. Input/Output Points:

HP/AC Monitoring	I/O Points						
Point Name/Description/Legend X = DDC I/O L = Local Control A = Adjustable O = Override	AI	AO	BI	BO	Trend	GUI	Device
HP/AC Monitoring Enable				X	X	X	
Space Temperature (RMT)	X				X	X	TS-W
Space Humidity (RMRH)	X				X	X	RH-W
CRAC Alarm (ALARM)			X		X	X	
Analog Trends shall record data samples every 5 minutes, unless noted otherwise. Binary Trends shall record data samples every Change of Value (COV)							

2. Control Parameters and Settings

HP/AC Monitoring	Parameters and Settings			
Parameter Name/Description X = Display on GUI C = Concealed A = Adjustable	AV	Trend	GUI	Initial-Setting
Setpoint and/or Parameters	A	X	C	Alarm settings
Alarm Reset	A	X	X	
Analog Trends shall record data samples every 5 minutes, unless noted otherwise. Binary Trends shall record data samples every Change of Value (COV)				

3. Alarms

HP/AC Monitoring	Alarms and Conditions		
Alarm Name	Point	Normal	Alarm
Unit Alarms	BACnet	As applicable	As applicable

1.7 ELECTRIC BASEBOARD WALL CABINET HEATER ECH

- A. Electric Wall Heaters ECH-1
- Service: As shown on the drawings.
 - Integral thermostat shall cycle resistance heating, element to maintain space set point temperature. F.
- B. EXHAUST FANS EF-1
- A. "Occupied Mode" Exhaust fan shall be interlock with light switch.
- B. "Unoccupied Mode" When light switch is off, the EF-1 shall be commanded off. The fan has a barometric damper to close when fan is off.

1.8 COMMISSIONING

- A. Startup: The ATC system shall be set up & checked by factory trained competent technicians skilled in the setting & adjustment of the ATC equipment used in this project. The technicians are to be experienced in the type of HVAC systems associated with this project.
- B. Demonstration: At the completion of the commissioning, The ATC contractor (ATC) shall: demonstrate the sequence of operations for each system to the Architect or representative.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230993

SECTION 232300 – REFRIGERANT 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. This Section includes refrigerant piping used for air conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air Conditioning Applications: 300 psig.
 - 2. Suction Lines for Heat Pump Applications: 535 psig.
 - 3. Hot Gas and Liquid Lines: 535 psig.

1.4 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
 - 1. Thermostatic expansion valves.
 - 2. Solenoid valves.
 - 3. Filter dryers.
 - 4. Strainers.
 - 5. Pressure-regulating valves.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
 - 1. Shop Drawing Scale: 1/4 inch equals 1 foot.
 - 2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
- C. Welding certificates.

- D. Field quality control test reports.
- E. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.

2.2 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:
 - 1. Body and Bonnet: Forged brass or cast bronze; globe design with straight through or angle pattern.
 - 2. Diaphragm: Phosphor bronze and stainless steel with stainless steel spring.
 - 3. Operator: Rising stem and hand wheel.
 - 4. Seat: Nylon.
 - 5. End Connections: Socket, union, or flanged.
 - 6. Working Pressure Rating: 500 psig.
 - 7. Maximum Operating Temperature: 275 deg F.
- B. Packed Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.

4. End Connections: Threaded.
 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
 6. Working Pressure Rating: 400 psig.
 7. Maximum Operating Temperature: 240 deg F.
 8. Manual operator.
- F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
 2. Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Seat Disc: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Working Pressure Rating: 400 psig.
 6. Maximum Operating Temperature: 240 deg F.
- G. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
 5. Suction Temperature: 40 deg F.
 6. Superheat: Adjustable.
 7. Reverse-flow option (for heat pump applications).
 8. End Connections: Socket, flare, or threaded union.
 9. Working Pressure Rating: 700 psig.
- H. Replaceable-Core Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted steel shell with ductile iron cover, stainless steel screws, and neoprene gaskets.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless steel support.
 3. Desiccant Media: Activated alumina.

4. Designed for reverse flow (for heat pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig.
 8. Working Pressure Rating: 500 psig.
 9. Maximum Operating Temperature: 240 deg F.
- I. Permanent Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted steel shell.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless steel support.
 3. Desiccant Media: Activated alumina.
 4. Designed for reverse flow (for heat pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig.
 8. Working Pressure Rating: 500 psig.
 9. Maximum Operating Temperature: 240 deg F.

2.3 REFRIGERANTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Atofina Chemicals, Inc.
 2. DuPont Company; Fluorochemicals Div.
 3. Honeywell, Inc.; Genetron Refrigerants.
 4. INEOS Fluor Americas LLC.
- B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines NPS 3-1/2 and Smaller for Conventional Air Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

- B. Hot Gas and Liquid Lines and Suction Lines for Heat Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- C. Safety Relief Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install packed-angle valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at inlet and outlet of hot gas bypass valves and strainers if they are not an integral part of valves and strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install packed-angle valves on inlet and outlet side of filter dryers.
- E. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 - 1. Install valve so diaphragm case is warmer than bulb.
 - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 - 3. If external equalizer lines are required, make connection where it will reflect suction line pressure at bulb location.
- F. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety relief valve discharge line to outside according to ASHRAE 15.
- G. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- H. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:
 - 1. Solenoid valves.
 - 2. Thermostatic expansion valves.
 - 3. Hot gas bypass valves.
 - 4. Compressor.
- I. Install filter dryers in liquid line between compressor and thermostatic expansion valve and in the suction line at the compressor.
- J. Install receivers sized to accommodate pump-down charge.

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction

loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping adjacent to machines to allow service and maintenance.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- J. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels if valves or equipment requiring maintenance is concealed behind finished surfaces.
- K. Slope refrigerant piping as follows:
 - 1. Install horizontal hot gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Liquid lines may be installed level.
- L. When brazing or soldering, remove solenoid valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb.
- M. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- N. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.
- F. Welded Joints: Construct joints according to AWS D10.12/D10.12M.
- G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Division 23 Section, "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
 - 2. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
 - 2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
 - 3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
 - 4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 - 9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. Comply with ASME B31.5, Chapter VI.

2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure. Test piping in accordance with the Mechanical Code of New York State.
3. Test high and low pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
 1. Install core in filter dryers after leak test but before evacuation.
 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
 4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high and low pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set point temperature of air conditioning or chilled water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 1. Open shutoff valves in condenser water circuit.
 2. Verify that compressor oil level is correct.
 3. Open compressor suction and discharge valves.
 4. Open refrigerant valves except bypass valves that are used for other purposes.
 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 – METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg (minus 500 to plus 2500 Pa). Metal ducts include the following:
 - 1. Rectangular ducts and fittings.
 - 2. Single-wall round spiral-seam ducts and formed fittings.
 - 3. Sheet metal materials.
 - 4. Sealants and gaskets.
 - 5. Hangers and supports.
 - 6. Seismic-restraint devices.
- B. Related Sections include the following:
 - 1. Section 230593 "Testing, Adjusting, and Balancing for HVACR" 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.

1.3 DEFINITIONS

- A. NUSIG: National Uniform Seismic Installation Guidelines.

1.4 SYSTEM DESCRIPTION

- A. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.5 SUBMITTALS

- A. Shop Drawings: CAD-generated and drawn to 1/4 inch equals 1 foot. Show fabrication and installation details for metal ducts.
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Duct layout indicating sizes and pressure classes.

3. Elevations of top and bottom of ducts.
 4. Dimensions of main duct runs from building grid lines.
 5. Fittings.
 6. Reinforcement and spacing.
 7. Seam and joint construction.
 8. Penetrations through fire-rated and other partitions.
 9. Equipment installation based on equipment being used on Project.
 10. Duct accessories, including access doors and panels.
 11. Hangers and supports, including methods for duct and building attachment, vibration isolation, and seismic restraints.
- B. Coordination Drawings: Reflected ceiling plans, 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. Ceiling suspension assembly members.
 2. Other systems installed in same space as ducts.
 3. Ceiling- and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
 4. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- C. Welding certificates.
- D. Field quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel," for hangers and supports and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. Compliance: Mechanical Code 2015 of New York State.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 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."

2.3 SINGLE-WALL ROUND 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. 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 (1524 mm) in Diameter: Flanged.
- C. 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 (2286 mm) in diameter with butt-welded longitudinal seams.
 - 2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.
- D. 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."

2.4 SHEET METAL MATERIALS

- A. 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: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, matte finish for exposed ducts.
- D. Aluminum Sheets: ASTM B 209 (ASTM B 209M), alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.5 SEALANT MATERIALS

- A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.
- B. Joint and Seam Tape: 2 inches (50 mm) wide; glass-fiber-reinforced fabric.
- C. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
- D. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.
- E. Solvent-Based Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant formulated with a minimum of 75 percent solids.
- F. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.
- G. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.6 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
 - 2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
- B. Hanger Materials: Galvanized sheet steel or threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electro-galvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
 2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
 3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
 3. Supports for Aluminum Ducts: Aluminum support materials unless materials are electrolytically separated from ducts.

2.7 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] [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] [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] [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.

2.8 RECTANGULAR DUCT FABRICATION

- A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.

2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
 1. Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Nexus Inc.
 - c. Ward Industries, Inc.
 - d. McGill AirFlow LLC.
 - e. Or Approved Equal.
- C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.
 1. Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Lockformer.
 - c. McGill AirFlow LLC.
 - d. SEMCO LLC
 - e. Or Approved Equal.

2.9 ROUND DUCT AND FITTING FABRICATION (WHERE INDICATED ON DRAWINGS)

- A. Round, Longitudinal- and Spiral Lock-Seam Ducts: Fabricate exhaust air ducts of aluminum according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
 1. Manufacturers:
 - a. McGill AirFlow Corporation.
 - b. SEMCO Incorporated.
 - c. Ductmate Industries, Inc.
 - d. Spiral Manufacturing Co.
 - e. Or Approved Equal.
- B. Duct Joints:
 1. Ducts up to 20 Inches (500 mm) in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
 2. Ducts 21 to 72 Inches (535 to 1830 mm) in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.
 3. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.
 - a. Manufacturers:
 - 1) Ductmate Industries, Inc.
 - 2) Lindab Inc.

- 3) SEMCO Incorporated.
 - 4) McGill AirFlow Corporation.
 - 5) Or Approved Equal.
- C. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.
- D. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.
- E. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:
1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
 2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg (minus 500 to plus 500 Pa):
 - a. Ducts 3 to 36 Inches (75 to 915 mm) in Diameter: 0.034 inch (0.85 mm).
 3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg (500 to 2500 Pa):
 - a. Ducts 3 to 26 Inches (75 to 660 mm) in Diameter: 0.034 inch (0.85 mm).
 4. Round Elbows 8 Inches (200 mm) and Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
 5. Round Elbows 9 through 14 Inches (225 through 355 mm) in Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
 6. Die-Formed Elbows for Sizes through 8 Inches (200 mm) in Diameter and All Pressures 0.040 inch (1.0 mm) thick with 2-piece welded construction.
 7. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
 8. Pleated Elbows for Sizes through 14 Inches (355 mm) in Diameter and Pressures through 10-Inch wg (2500 Pa): 0.022 inch (0.55 mm).

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

- A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:

1. Return Ducts (Negative Pressure): 2 inch wg.
2. Exhaust Ducts (Negative Pressure): 2-inch wg.

B. All ducts shall be galvanized steel and air intake shall be heavy gauge aluminum construction.

3.2 DUCT INSTALLATION

- A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
- B. Install round ducts in lengths not less than 12 feet (3.7 m) unless interrupted by fittings.
- C. Install ducts with fewest possible joints.
- D. Install fabricated fittings for changes in directions, size, and shape and for connections.
- E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches (300 mm), with a minimum of 3 screws in each coupling.
- F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
- J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
- L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches (38 mm).
- N. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Refer to SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
- O. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."

- P. Paint interiors of metal ducts, that do not have duct liner, for 24 inches (600 mm) upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.3 SEAM AND JOINT SEALING

- A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.
 - 1. For pressure classes lower than 2-inch wg (500 Pa), seal transverse joints.
- B. Seal ducts before external insulation is applied.

3.4 HANGING AND SUPPORTING

- A. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- B. Support vertical ducts at maximum intervals of 16 feet (5 m) and at each floor.
- C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
- D. Install concrete inserts before placing concrete.
- E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors according to Division 23 Section "Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
 - 1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (500 Pa) (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg (500 to 2500 Pa).
4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

3.7 CLEANING NEW SYSTEMS

- A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.
- B. Use service openings, as required, for physical and mechanical entry and for inspection.
 1. Create other openings to comply with duct standards.
 2. Disconnect flexible ducts as needed for cleaning and inspection.
 3. Remove and reinstall ceiling sections to gain access during the cleaning process.
- C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.
- D. Clean the following metal duct systems 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, and actuators except in ceiling plenums and mechanical equipment rooms.
 6. Supply-air ducts, dampers, actuators, and turning vanes.
- 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 or duct accessories.
- F. Cleanliness Verification:
 1. Visually inspect metal ducts for contaminants.
 2. Where contaminants are discovered, re-clean and reinspect ducts.

END OF SECTION 233113

SECTION 233300 – 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. Manual volume dampers.
 - 2. Control dampers.
 - 3. Flange connectors.
 - 4. Turning vanes.
 - 5. Flexible connectors.
 - 6. Flexible ducts.

1.3 ACTION SUBMITTALS

- A. 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, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.

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.

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 (Z275).
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Standard leakage rating, with linkage outside airstream.
 - 2. Suitable for horizontal or vertical applications.
 - 3. Frames:
 - a. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 4. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch (1.62 mm) thick.
 - 5. Blade Axles: Galvanized steel.
 - 6. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 7. Tie Bars and Brackets: Galvanized steel.
- B. Low-Leakage, Steel, Manual Volume Dampers:

1. Comply with AMCA 500-D testing for damper rating.
2. Low-leakage rating with linkage outside airstream and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
3. Suitable for horizontal or vertical applications.
4. Frames:
 - a. Angle shaped.
 - b. 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
 - c. Mitered and welded corners.
 - d. 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, roll-formed steel, 0.064 inch (1.62 mm) thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Blade Seals: Neoprene.
9. Jamb Seals: Cambered aluminum.
10. Tie Bars and Brackets: Galvanized steel.
11. Accessories:
 - a. Include locking device to hold single-blade dampers in a fixed position without vibration.

2.4 FLANGE CONNECTORS

- A. Description: roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- B. Material: Galvanized steel.
- C. Gage and Shape: Match connecting ductwork.

2.5 FLEXIBLE CONNECTORS

- A. Materials: Flame-retardant or noncombustible fabrics.
- B. Coatings and Adhesives: Comply with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

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. Install volume dampers at points on supply and return 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.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install fire dampers according to UL listing.
- G. Install flexible connectors to connect ducts to equipment.
- H. Connect terminal units to supply ducts with maximum 6-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- I. Connect flexible ducts to metal ducts with [adhesive plus sheet metal screws.
- J. Install duct test holes where required for testing and balancing purposes.
- K. 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 (6-mm) 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 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 233416 – CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. 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: Include rated capacities, furnished specialties, and accessories for each type of product indicated and 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.
- B. 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. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Show fan room layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. AMCA compliance is an optional requirement and not necessarily available from all manufacturers.
- B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA 1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL FANS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on the drawings or approved equal:
 - 1. Greenheck
 - 2. Loren Cook
 - 3. Or Approved Equal
- D. Exhaust Fans – Model SBE:
 - 1. Model SBE wall mounted propeller fan shall be belt drive type. The fan housing and shroud shall be constructed of heavy gauge aluminum with a rigid internal support structure. The fan shroud shall have a rolled bead for added strength.

2. Galvanized steel construction - Heavy gauge mounting flanges - Pre-punched mounting holes – Inside flanges allow damper to be mounted - Overlapping weatherhood flange keeps rain out - OSHA Protective guard of welded steel wire completely protects the drive side of the wall housing.
3. Motors shall be mounted out of the airstream on vibration isolators. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance.
4. A disconnect switch shall be factory installed and wired from the motor compartment for ease of electrical wiring. Galvanized rigid wire protects the fan's discharge from birds or small objects.
5. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.
6. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.
7. Enclosure constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide a degree of protection against falling dust. This enclosure meets the rod entry and the indoor corrosion protection design tests. The rod entry test is intended to simulate incidental contact with enclosure equipment. Enclosure is equipped with provision to lockout in the off position with customer supplied lock..

2.2 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Comply with 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. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install centrifugal fans level and plumb.
- B. Support suspended units from structure using threaded steel rods and vibration isolators.
- C. Install units with clearances for service and maintenance.

3.2 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 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. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.
 10. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 233416

SECTION 233713 – DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.
- B. Related Sections include the following:
 - 1. Division 23 Section "Duct Accessories" for fire dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

- A. Product Data: For each product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.
- B. Coordination Drawings ceiling plans, 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. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 5. Duct access panels.
- C. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.
- D. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 DIFFUSERS AND REGISTERS

- A. Manufacturers:
 1. Titus
 2. Anemostat; a Mestek Company
 3. Carnes
 4. Approved Equal
- B. Refer to drawings for types of diffusers, registers and grilles in this project. Model #'s and Mfr's names have been provided on the drawings.

2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 238126 – SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes split-DX heat pump and air conditioning units.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.
- F. Warranty: Special warranty specified in this Section.

1.4 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. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- C. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

1.5 COORDINATION

- A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."

1.6 EXTRA MATERIALS

- 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. Filters: One set of filters for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Lennox Applied
2. Trane
3. Carrier
4. Or Approved Equal.

2.2 UNITS

- A. System Description: The Air Conditioner system shall be a Trane split system with gas fired furnace. The system shall consist of a horizontal discharge, single phase outdoor unit, matched capacity indoor cassette units that shall be equipped with a wired wall mounted, wireless wall mounted remote controller. Refer the drawings and mechanical schedules for types of models of units.

- B. Quality Assurance:

1. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
2. All wiring shall be in accordance with the National Electrical Code (N.E.C.) and local codes as required.
3. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 210 and bear the ARI Certification label.
4. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
5. A dry air holding charge shall be provided in the indoor section.
6. The outdoor unit shall be pre-charged with R-410a refrigerant for 70 feet (20 meters) of refrigerant tubing.
7. System efficiency shall meet or exceed SEER values as scheduled on the plans.

C. Delivery, Storage and Handling:

1. Unit shall be stored and handled according to the manufacturer's recommendations.
2. The controller shall be shipped separately and shall be able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.

D. Warranty:

1. The units shall have a manufacturer's parts and defects warranty for a period five (5) year from date of installation. The compressor shall have a warranty of seven (7) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.
2. Manufacturer shall have over thirty (30) years of continuous experience in the U.S. market.

E. Outdoor Unit Design:

1. The outdoor unit shall be equipped with an electronic control board that interfaces with the indoor unit to perform all necessary operation functions.
2. The outdoor unit shall be capable of cooling operation down to 0°F (-18°C) ambient temperature without additional low ambient controls (optional wind baffle shall be required).
3. The outdoor unit shall be able to operate with a maximum height difference of 100 feet between indoor and outdoor units.
4. System shall operate at up to a maximum refrigerant tubing length of 165 feet (50 meters) for the 36,000 units between indoor and outdoor units without the need for line size changes, traps or additional oil.
5. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.
6. Outdoor unit sound level shall not exceed 48dB (A).

F. Cabinet:

1. The casing shall be constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection.
2. Mounting feet shall be provided and shall be welded to the base of the cabinet and be of sufficient size to afford reliable equipment mount and stability.
3. Easy access shall be afforded to all serviceable parts by means of removable panel sections.
4. The fan grill shall be of ABS plastic.

5. Cabinet mounting and construction shall be sufficient to withstand 155 MPH wind speed conditions for use in Hurricane condition areas. Mounting, base support, and other installation to meet Hurricane Code Conditions shall be by others.

G. Fan:

1. Each unit shall be furnished with a single DC fan motor.
2. The fan blade(s) shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated.
3. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent external contact with moving parts.

H. Coil:

1. The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up and allow maximum airflow. The coil shall be protected with an integral metal guard.
2. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV) metering device. The LEV shall be controlled by a microprocessor controlled step motor.
3. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a - Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102.

I. Compressor:

1. The compressor shall be scroll.
2. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which shall result in significant energy savings.
3. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.
4. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

J. Electrical:

1. The electrical power of the unit shall be 208volts, single phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 187 volts to 253 volts.

2. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC.
4. The unit shall have Pulse Amplitude Modulation circuit to utilize 98% of input power supply.

K. Operating Range:

1. The Cooling Operating Temperature Range shall be 0°F to 118°F.
2. The Heating Operating Temperature Range shall be -4°F to 78°F.

L. Unit Cabinet:

1. The cabinet shall be formed from high strength molded plastic with smooth finish, flat front panel design with access for filter. Cabinet color shall be white.

M. Fan:

1. The indoor unit fan shall be high performance, double inlet, forward curve, direct drive sirocco fan with a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of three (3) speeds: Low, Mid, and Hi and Auto. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.

O. Vane:

1. There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall significantly decrease downward air resistance for lower sound levels, and shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement.

P. Filter:

1. Return air shall be filtered by means of an easily removable disposable filter.

Q. Coil:

1. The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil. An optional drain pan level switch (DPLS1), designed to connect to the control board, shall be provided if required, and installed on the condensate pan to prevent condensate from overflowing.

R. Electrical:

1. The electrical power of the unit shall be 120 volts, 1 phase, 60 hertz. The system shall be capable of satisfactory operation within voltage limits of 100 volts to 125 volts. The power to the indoor unit shall be supplied from the outdoor unit, using the Mitsubishi Electric A-Control system. For A-Control, a two (3) conductor AWG-14 wire with ground

shall provide power feed and bi-directional control transmission between the outdoor and indoor units.

S. Performance:

1. Each system shall perform in accordance to the ratings shown in the manufacturer catalog. Cooling performance shall be based on 80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) for the indoor unit and 95°F DB, 75°F WB (35°C DB, 29.3°C WB) for the outdoor unit.

T. System Control:

1. The control system shall consist of a minimum of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from a wireless or wired controller, providing emergency operation and controlling the outdoor unit. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Indoor units shall have the ability to control supplemental heat via connector CN152 and a 12 VDC output.

U. System Control: The indoor unit control board shall have auxiliary control contact connectors.

V. Remote Controllers: All remote controllers need to be ordered separately from the unit. Provide remote controllers as called out on the drawings and mechanical schedules.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install in-door units using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install roof-mounting outdoor units on equipment supports. Anchor units to supports with removable, cadmium-plated fasteners.
- D. Install seismic restraints.
- E. Install outdoor units on restrained, spring isolators with a minimum static deflection of 1 inch.
- F. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to unit to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 1 Section "Closeout Procedures / Demonstration and Training."

END OF SECTION 238126

SECTION 260500 – BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Grounding and bonding.
 - 2. Supports.
 - 3. Identification.
- B. Related Sections:
 - 1. Excavation and backfill: Division 2.
 - 2. Firestopping: Division 7.

1.2 REFERENCES

- A. NFPA 70-93 -- National Electrical Code; National Fire Protection Association; 2008.
- B. Standard of Installation; National Electrical Contractors Association (NECA).

1.3 QUALITY ASSURANCE

- A. Conform to NFPA 70.
- B. Conform to requirements of NECA "Standard of Installation" that do not conflict with regulatory requirements or requirements of contract documents.
- C. Furnish products listed by Underwriters Laboratories Inc. and classified as suitable for installed use and environmental conditions.

PART 2 - PRODUCTS

2.1 NAMEPLATES

- A. Description: Engraved plastic.
- B. Nameplate Color: Black letters on white background.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces intended to support products.
- B. Verify that each product conforms to regulatory requirements and to specification requirements.

3.2 PREPARATION

- A. Clean surfaces to receive work.
- B. Protect surrounding elements from work of this section.

3.3 GROUNDING AND BONDING

- A. Make grounding electrode connections to meet regulatory requirements.
- B. Provide and use the following grounding electrode systems:
 - 1. Metal underground water pipe.
 - 2. Metal building frame.
 - 3. Concrete-encased electrode in building foundation.
- C. Make grounding and bonding connections to separately derived systems to meet regulatory requirements.

3.4 ANCHORS AND SUPPORTS

- A. Select fasteners and anchors that are suitable for surfaces to which they attach.
- B. Select fasteners and anchors with suitable load rating to support installed products.
- C. Do not use nails for permanent supports.
- D. Fasten supports to sheet metal framing channels using sheet metal screws.
- E. Fasten supports to metal surfaces and elements using machine screws and bolts or beam clamps.
- F. Do not use spring steel clips and clamps to fasten supports.
- G. Do not cut or drill structural elements.

3.5 IDENTIFICATION

- A. Secure nameplates to equipment and enclosures using noncorrosive screws or rivets, or appropriate adhesive.

3.6 FIELD QUALITY CONTROL

- A. Correction of Defective Work:
 - 1. Replace defective products.

3.7 CLEANING

- A. Restore damaged corrosion-resistant coatings.

END OF SECTION 260500

SECTION 260501 – ELECTRICAL – GENERAL

CONTENTS

16.1.1	Scope of Work	16.1.16	Conduit
16.1.2	General	16.1.17	Conductors
16.1.3	Plans & Drawings	16.1.18	Labels
16.1.4	Standards	16.1.19	Outlet Boxes
16.1.5	Applicable Publications	16.1.20	Pull & Junction Boxes
16.1.6	National Fire Protection Assn. (NEMA) Publication	16.1.21	Device Plates
16.1.7	National Fire Protection Assn. (NFPA) Publication	16.1.22	Receptacles & Switches
16.1.8	Underwriters' Laboratories, Inc. (UL) Standards	16.1.23	Molded Case Circuit Breakers
16.1.9	Materials & Equipment	16.1.24	Panelboards
16.1.10	Approval of Materials & Equipment	16.1.25	Supporting Devices
16.1.11	Shop Drawings	16.1.26	Motor Controls
16.1.12	Working Drawings	16.1.27	Restoration of Surfaces
16.1.13	Workmanship	16.1.28	Permits, Fees, & Certifications
16.1.14	Grounding	16.1.29	Inspections
16.1.15	Inst. of Conduits & Fittings	16.1.30	Operational Tests
		16.1.31	Documentation Procedures
		16.1.32	Closeout Procedures
		16.1.33	Guarantee
		16.1.34	Safety & Disconnect Switches

16.1.1 Scope of Work: The scope of work under this section covers the electrical requirements of the heating system upgrading.

1. Contractor shall provide electric service to the new equipment as shown on the drawings.
2. Contractor shall modify existing electric panels to allow connection of new equipment. Provide new electrical panels where indicated on the drawings.
3. Contractor shall remove obsolete and abandoned circuits, conduit, and fittings.
4. Contractor shall connect all new equipment with motor starters and disconnect switches as shown or required.
5. Connect power and control wiring to new damper motors.
6. Provide submittals, shop drawings, manufacturers cuts as required.
7. All work to be performed in accordance with latest NEC and Local Electric Code and local authorities having jurisdiction.
8. Provide electrical power to all new pumps and equipment in the Boiler Room.
9. Provide and install new light fixtures at locations indicated on the drawings. Provide new switches and wiring to new circuit breaker in existing electrical panel.
10. Contractor shall connect all terminal equipment (unit heater, RTU units, AHU units, etc.) and make all power and final control connections necessary for a complete and operating system.
11. Provide new circuits required for temperature control system.

12. Provide all required power supplies for all mechanical equipment, including starters, disconnects, and other required electrical devices, except where specified as furnished or factory installed by the manufacturer.
13. Provide power supply to all temperature control modules, coordinate location with the Mechanical Contractor.
14. All cutting and patching for the Electrical Contractor shall be performed by the Electrical Contractor.
15. Furnish and install new duct smoke detectors as shown on the drawings. Perform NFPA reacceptance test of the existing fire alarm system upon completion of system upgrades. Provide owner with copy of certification per NFPA standards.
16. Electrical contractor shall coordinate the mechanical equipment demolitions with the mechanical contractor.

16.1.2 General:

1. The entire installation shall be performed in a workmanlike manner, left completely connected, and ready to give proper and continuous service.
2. All materials and work in connection with the foregoing items shall be as specified herein or as called for on the contract drawings.
3. In furnishing a proposal, the Contractor confirms agreement to all items and conditions referred to herein and/or indicated on accompanying drawings; no consideration shall be granted for alleged misunderstanding.

16.1.3 Plans and Drawings:

1. The Engineer's drawings, which constitute an integral part of this contract, shall serve as contract drawings. They indicate the general layout of the renovated electrical system and show arrangements of feeders, panelboards, switchboards, disconnects, conduits, service equipment, and other work.
2. Field verification or correction of scale dimensions on plans is directed, since actual locations, distances, and levels are to be governed by local field conditions.
3. Discrepancies shown on different plans, or between plans and actual field conditions shall be brought to the attention of the Engineer promptly for resolution.

16.1.4 Standards: All work, equipment, and materials furnished shall conform with the existing rules, requirements, and specifications of the Insurance Rating Organization having jurisdiction, the National Electric Code (NEC), the National Electric Manufacturer's Association (NEMA), the Institute of Electrical and Electronic Engineers (IEEE), the Insulated Power Cable Engineers Association (IPCEA), the American Society of Testing Materials (ASTM), the American National Standards Institute (ANSI), the requirements of the Occupational Safety Hazards Act (OSHA), and all other applicable Federal, State, and local laws and/or ordinances.

All material and equipment shall bear the inspection labels of Underwriters' Laboratories, if the material and equipment is of the class inspected by said laboratories.

Any paragraph of requirements in these specifications, or drawings, deviating from the rules, requirements, and specifications of the above organizations shall be invalid and their requirements shall hold precedent thereto. The rules, requirements, and specifications as set forth above and any additional work or material necessary for adherence will not be allowed as an extra, but shall be included in the bid price. Ignorance of any rule, requirement, or specification shall not be allowed as an excuse for non-conformity. Acceptance by the Engineer does not relieve the Contractor from any expense involved for the correction of any errors which may exist in the drawings submitted or in the satisfactory operation of any equipment.

Acceptance by the Engineer does not relieve the Contractor from the expense involved for the correction of any errors which may exist in the drawings submitted or in the satisfactory operation of any equipment.

16.1.5 Applicable Publications: The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

Federal Specifications:

J-C-30A& Am-1	Cable and Wire, Electrical (Power, Fixed Installation)
W-B-811b&Am-2	Busway System, Power, Electrical, 600 Volts
W-F-406B&Int. Am-1 (GSA-FSS)	Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible
L-T-0075 (ARMY-MO)	Tape, Pipe-Coating; Pressure-Sensitive and Laminated
L-T-001512 (GSA-FSS)	Tape, Pressure Sensitive Adhesive, Pipe Wrapping
W-C-375a & Int. Am-4 (GSA-FSS)	Circuit Breaker, Molded Case; Branch Circuit & Service
W-C-538b	Conduit Boxes and Outlet Fittings, Floor, (for Rigid Metal Conduit)
W-C-596D/GEN	Connector, Plug, Receptacle and Cable Outlet, Electrical Power
W-C-1094	Conduit and Fittings; Non-Metallic, Rigid (Plastic)
W-F-406b & Int. Am-1	Fittings for Cable, Power, Electrical and Conduit, Metal Flexible
W-F-408C & Am-1	Fittings for Conduit, Metal, Rigid (Thick Wall and Thin Wall (EMT) Type)
W-J-800c	Junction Box, Extension, Junction and Am-3 Box; Cover, Junction Box (Steel, Cadmium, or Zinc Coated)
W-P-115a & Am-2	Panel, Power Distribution
W-P-455a & Am-4	Plate, Wall Electrical
W-S-610c	Splice Conductor.

W-S-893c & Int. Am-1 (GSA-FSS)	Switch, Toggle, and Mounting Strap, (Interchangeable)
W-S-986E	Switches, Toggle (Toggle & Lock) Flush Mounted (General Specification)
HH-1-510D	Insulation Tape, Electrical Friction
HH-1-553B	Insulation Tape, Electrical, (Rubber, Natural & Synthetic)
HH-1-595B	Insulation Tape, Electrical, and Am-1 Pressure Sensitive Adhesive, Plastic, General Purpose
WW-C-00540c	Conduit, Metal, Rigid: and (GSA-FSS) Coupling, Elbow, and Nipple, and Int. Am-1 Electrical Conduit: Aluminum (GSA-FSS)
WW-C-568A	Conduit, Metal, Rigid: Electrical Thin Wall Type (Electrical Metallic Tubing); Straight Lengths, Elbows and Bends.
WW-C-566b	Conduit, Metal Flexible
WW-C-581d & Am-3	Conduit, Metal, Rigid: and Coupling, Elbow and Nipple, Electrical Conduit: Zinc Coated

16.1.6 National Fire Protection Association (NEMA) Publication:

Latest Edition

16.1.7 National Fire Protection Association (NFPA) Publication:

No. 70 National Electrical Code - Latest Edition

16.1.8 Underwriters' Laboratories, Inc. (UL) Standards:

All equipment to be UL approved.

16.1.9 Materials and Equipment: Materials and equipment shall conform to the respective publications and other requirements specified below. Other materials and equipment shall be as specified elsewhere herein and shall be the products of manufacturers regularly engaged in the manufacturing of such products.

Cable, Flexible: Federal Specification J-C-30.

Metallic Armored Cable: Type ACHH or ACT.

Non-Metallic Sheathed Cable: Type NM or NMC, with ground conductor.

Circuit Breakers:

Low Voltage Power Circuit Breakers: NEMA Standard SG 3.

Molded Case Circuit Breakers: Federal Specification W-C-375.

Conductors, Insulated: Federal Specification J-C-30, types as specified.

Conduit:

Zinc-coated Rigid Steel Conduit: Federal Specification WW-C-581.

Rigid Aluminum: Federal Specification WW-C-540

Connectors, Wire Pressure: Federal Specification W-S-610.

Device Plates: Federal Specification W-P-455.

Fittings, Cable and Conduit: Federal Specifications W-F-406 & W-F-408

Outlets:

Conduit, Cast Metal or Malleable Metal: Federal Specification W-C-586

Outlet Boxes:

Sheet-Steel Outlet Boxes: Federal Specification W-J-800

Panelboards: Dead-front construction, Federal Specification W-P-115

Lighting & Appliance Branch Circuit: Feeder and Distribution Panelboards, Class 1, Type as Specified Hereinafter

Load-Center Panelboards: Type 1, Class 2

Receptacles: Federal Specification W-C-596

Service Equipment: (Federal Specification W-S-865, Type NDD or NDS as indicated), (Federal Specification W-C-375), and Underwriters' Laboratories, Inc., Standard UL 869

Switches:

Enclosed Safety Switches: Federal Specifications W-S-865, Type NDS or NDD as indicated.

Toggle Switches, Multiple Type: Federal Specification W-S-893

Toggle Switches, Multiple Type: Federal Specification W-S-896

Tape:

Friction Tape: Federal Specification HH-1-510.

Plastic Tape: Federal Specification HH-1-595.

Rubber Tape: Federal Specification HH-1-553.

16.1.10 Approval of Materials and Equipment: Approval of materials and equipment shall be based on the manufacturer's published data. The label or listing of the Underwriters' Laboratories, Inc. will be

accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor shall submit a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements. A manufacturer's statement indicating complete compliance with the applicable Federal Specification, Military Specification, or standard of the American Society for Testing and Materials (ASTM), National Electrical Manufacturers, or other commercial standard is acceptable.

16.1.11 Shop Drawings: The Contractor shall submit complete manufacturer's data of all equipment, appurtenances and accessories, including the following:

- 3Ø, 60 Hz distribution and control equipment;
- lighting and receptacle panels;
- branch circuit feeders;
- luminaires;
- disconnect switches and starters;
- circuit breakers;
- all other electrical work items.

The Contractor shall submit all manufacturer's data at least one (1) month prior to the installation of the equipment. Equipment installation shall not be permitted until manufacturer's data has been reviewed by the Engineer.

16.1.12 Working Drawings: The contract drawings are not intended to serve as working or installation drawings. These drawings are for engineering and general arrangement purposes only. The Contractor shall prepare his own working drawings based on the contract drawings.

With submittals the Contractor shall notify the Engineer of all departures from the contract drawings and specifications; otherwise, acceptance of such submittals will not constitute acceptance of the subject matter thereof only and not of any other structure, material or apparatus shown or indicated.

Materials or equipment shall not be ordered nor shall any work be performed by the Contractor before the materials, equipment, and the working drawings as herein required have been reviewed by the Engineer and the Contractor advised to furnish as submitted or furnish as otherwise noted.

Upon completion of the work and as a condition precedent to obtaining final acceptance of the work, the Contractor shall furnish to the Engineer four (4) complete sets of instructions, technical bulletins, and any other printed matter, such as diagrams, prints, or drawings, containing full information required for the proper operation, maintenance, and repair of the equipment installed and for ordering spare parts.

All conduit 2" or greater in diameter shall be shown in scaled layout, both plan and elevations, to ascertain head clearances and to assure the avoidance of openings and other project components; i.e., doors, access openings, equipment, piping, instrumentation devices, vaults, etc.

16.1.13 Workmanship: All materials and equipment shall be installed in accordance with recommendations of the manufacturer as approved by the Engineer to conform with contract documents. The installation shall be accomplished by workmen skilled in this type of work.

16.1.14 Grounding: Except where specifically indicated otherwise, all exposed non-current carrying metallic parts of electrical equipment and neutral conductor of the wiring system shall be grounded.

16.1.15 Installation of Conduits and Fittings: Each piece of conduit installed shall be free from defects.

The equivalent number of 90 degree bends in a single conduit run are limited to the following:

Runs in excess of 300 feet	0
Runs of 300 feet to 201 feet	1
Runs of 200 feet to 101 feet	2
Runs of 100 feet and less	3

Factory bent elbows or field bent elbows with approved tools may be used. Heating of conduit to facilitate bending is prohibited.

All exposed conduit shall be installed, either parallel or perpendicular to structural members, unless impractical, and shall be grouped wherever possible. Conduit shall be attached to structural components with approved supports spaced a maximum of six (6') apart and shall form a neat rigid installation. Conduit supported from building walls shall be installed with at least 1/4" clearance from the walls to prevent the accumulation of dirt and moisture behind the conduit.

Where conduit goes through a wall or floor, all openings will be core drilled in sufficient diameter to allow for the installation of a fireproof seal. All wall and floor penetration shall be fitted with a fireproof seal.

16.1.16 Conduit: Under this section the Contractor shall furnish and install all conduit and conduit fittings to complete the installation of all electrically operated equipment as specified herein and as shown on the contract drawings.

All exposed conduits in the Boiler Room shall be EMT. All exposed conduits in finished areas shall be in Wiremold.

Conduits passing through sleeves in interior walls and floors shall be tightly caulked.

16.1.17 Conductors: Under this section, the Contractor shall furnish and install all wires and cables for power, and lighting as required to complete the electrical installations.

Each coil or reel of insulated wire and cable furnished shall bear a tag, containing the Underwriters' Laboratories approval stamp (providing cable is of the class inspected by the said laboratory), name of manufacturer, trade designation, month and year of manufacture, and in no case shall be more than six months old. Wire and cable shall not have been stored in the weather outdoors.

All conductors shall be copper and stranded.

The following information for each size of wire and cable shall be submitted to the Engineer for acceptance:

- Name of cable manufacturer;
- Minimum insulation resistance in megohms;
- Per 1000 ft. at 15.5 deg C;
- Number and size of strands in each conductor;
- Conductor insulation in mils;
- Sheath thickness in mils;
- Average OD of bare conductor;
- Average overall diameter of finished cable;
- Weight per 1000' of finished cable.

Cable shall be shop tested in accordance with the latest standards and applicable test procedures of the specifications of the IPCEA and certified data shall be submitted in compliance with this requirement. Sample lengths of cable shall be submitted to the Engineer, if requested.

1. 600 V Single Conductor Cable:

- a. This cable shall be composed of stranded copper conductors insulated with a heat and moisture resistant cross linked synthetic polymer. Cables shall be rated not less than 600 V, and shall be for circuits operating in dry locations at a maximum conductor temperature of 90°C dry and temperature of 75°C wet. Cables shall be Underwriters' Laboratories listed as Type XHHW with flame resistant jacket, FR-1.
- b. The conductors shall be stranded annealed copper, the individual strands of which shall, before stranding, be in accordance with ASTM Designated B8 and B189.
- c. The conductors shall be insulated with properly flame-retardant, cross-linked synthetic polymer insulating compound.
- d. A suitable barrier tape shall be applied next to the conductor under the primary insulation, where needed to provide free stripping.
- e. The minimum average thickness of the insulation shall conform to the requirements of Table D. The insulation shall be circular in cross section and so centered that the minimum wall thickness shall be not less than the minimum average thickness shown in Table D.

TABLE D

Cable Type	Size of Conductor AWG & MCM	Insulation Thickness in Mils
Single Conductor	14 to 10	30
Heat and Moisture Resistant 600 V	8 to 2	45
For Conduit & Ducts	1 to 4/0	55
	250 to 500	65

2. Color Coding: Conductor insulation shall be color coded as follows:

208 Y/120 V System

Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White

Single conductor AC control wire shall be RED.

16.1.18 Labels:

1. Panelboard Directories: Use existing card provided by equipment manufacturer. Type identification of function and location for each new circuit using final room names and/or numbers as selected by Owner. Permanently fasten in place and protect behind glass or heavy gauge non-yellowing plastic cover. Permanently label equipment to match. As-built drawings shall include all circuit labeling, cabinet labeling and any other markings required. All labeling shall be neat and accurate.
2. Operational Identification and Warnings: Wherever reasonably required to ensure safe and efficient operation and maintenance of the electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install screw attached plastic signs or similar equipment identification, instruction or warning on switches, outlets and other controls, devices, and covers or electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for the intended purposes.

16.1.19 Outlet Boxes: The Contractor shall furnish and install all outlet boxes for power and lighting conforming with the requirements of this section.

1. Products: All boxes shall be galvanized steel, octagonal or square standing boxes of sizes adequate for the number of conductors installed.

16.1.20 Pull and Junction Boxes:

1. Description:
 - a. The Contractor shall furnish and install all junction and pullboxes as shown on the contract drawings and as required to properly install the electrical systems.
 - b. Boxes specified in this section are of the type which must be utilized where standard octagonal and square sheet steel or cast boxes as specified in outlet box section cannot be used.
2. Indoor Locations:
 - a. Pull and junction boxes for indoor exposed use shall be galvanized sheet steel. Provide security screws on all boxes installed in public areas.
3. Installation:
 - a. All junction boxes and pull boxes shall be solidly attached to structural members prior to installation of conduit and set true and plumb. Wooden plastic plugs are not permitted for securing boxes to concrete.
 - b. Where control wires must be interconnected in a junction box, terminal boards, consisting of an adequate number of screw type terminals shall be installed. Terminal board current carrying parts must be of ample capacity to carry the full load current of the circuits connected thereto. Approximately 20% of the total amount of terminals provided shall consist of spare terminals. Terminals shall be lettered and/or numbered to conform with the wiring diagrams.

16.1.21 Device Plates: Device plates shall be of the one piece type and shall be provided for all outlets and fittings to suit the devices installed. Plates on unfinished walls and on fittings shall be of zinc-

coated sheet steel or cast metal having rounded or beveled edges. Plates on finished walls shall be stainless steel finish. Screws shall be of metal with countersunk heads in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates installed in wet locations shall be gasketed.

16.1.22 Receptacles and Switches:

1. Receptacles: Single receptacles NEMA 5-15 shall be specification grade rated at 15 amps as indicated, 125 volts, two pole, three wire, grounded type with polarized parallel slots, in accordance with Federal Specification W-C-596. Bodies shall be of brown phenolic compound supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side or back wired with two screws per terminal, or shall have pressure type screwless terminals with suitable conductor release arrangement. The third grounding pole shall be connected to the metal mounting yoke.
2. GFI-Type Receptacles:
 - a. Furnish and install receptacles with ground fault circuit interrupters as indicated on the drawings and specifications.
 - b. Receptacles shall be NEMA 5-20R configuration with 120 VAC, 15 ampere circuit rating and brown in color.
 - c. All receptacles shall be of such depth as to permit mounting in outlet boxes 1 1/2" or greater in depth without the use of spacers. Units shall have line and load terminal screws such that connection to load terminals will provide ground fault protection for other receptacles or loads connected to these terminals.
 - d. All receptacles shall accept standard duplex wall plates.
 - e. All receptacles shall be noise suppressed to reduce nuisance tripping and shall be Underwriters' Laboratories listed.
3. Switches: Contractor shall use one-way, three-way, or four-way switches as required to match existing. Switches shall be rated 20A, 120-277 VAC.

16.1.23 Molded Case Circuit Breakers: Individual panelboard mounted circuit breakers shall be Molded Case Circuit Breakers.

1. General: Circuit breakers shall be UL listed and meet NEMA Standard No. AB1-1975, and Federal Specification No. W-C-375B/GEN where applicable. Breakers covered under this specification will be applied in panelboards.
2. Construction: Molded case circuit shall have over center, trip-free toggle-type operating mechanisms with quick-make, quick-break action and positive handle indication. Three pole breakers shall be common trip. Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole. The circuit breaker shall be constructed to accommodate the supply connections at either end. Circuit breaker operating handles shall assume a center position when tripped. All breakers shall be calibrated for operation in an ambient temperature of 40°C. A button shall be provided on the cover for mechanically tripping the circuit breaker.

Circuit breakers shall be suitable for mounting and operating in any position.

3. Terminations: Breakers shall have removable lugs. Lugs shall be UL listed for copper only conductors. Breakers shall be UL listed for installation of crimp lugs.

16.1.24 Panelboards:

1. Work Included: The Contractor shall furnish and install panelboards of voltage and current ratings as shown on the contract drawings. Panelboards shall be furnished with circuit breaker ratings, number of breakers, number of poles, and locations conforming with the panelboards on the contract drawings.
2. Enclosures:
 - a. The Contractor shall provide panelboards with concealed or semi-concealed hinges and with flush or semi-flush spring catch type flush cylinder locks. Cabinet doors of similar use shall be keyed alike. The Contractor shall set cabinet doors flush into cabinet trim. The Contractor shall equip trim with adjustable clamps or other approved means to fasten trim to cabinets. Fastening method shall permit adjustment for aligning the trim of flush cabinets to a plumb position. Trim for flush cabinets shall extend not less than 3/4" beyond the perimeter of the back box. Trim for surface cabinets shall extend not less than 3/4" beyond the perimeter of the back box. Trim for surface cabinets shall be even with the perimeter of the back box.
3. Appurtenances:
 - a. The Contractor shall provide panelboards with terminal strips. All panelboards shall be equipped with nameplates with 3/16" high black letters engraved in laminated white micarta. Nameplate shall include voltage ratings of panelboards, number of circuits, and panelboard designation.
 - b. The Contractor shall provide manufacturer's nameplate and Underwriters' Laboratories, Inc. Inspection label on interior of cabinet. For branch circuit panel, each circuit protective device shall be identified by permanent number referenced to circuit directory on interior of cabinet door.
4. Buswork:
 - a. Main bus bars shall be copper and of ample size so that a current density of not more than 400 amperes per square inch of cross section will be attained. This current density shall be based on the application of the full load connected to the panel plus approximately twenty-five percent (25%) of the full load for spare capacity. The main bus shall be full capacity as based on the preceding for the entire length of the panel so as to provide full flexibility of circuit arrangement.
 - b. Solid neutral bus bars, where required, shall be of copper.
 - c. Branch buswork shall be of copper and of rating to match the maximum branch circuit breaker which may be installed in the standard space.
5. Circuit Breakers:

- a. All circuit breaker contact shall be of non-welding non-corrodable silver alloy, housed in arc chambers, equipped with arc quencher plates. Contacts shall be quick make and quick break whether activated automatically or manually.
- b. Circuit breakers shall have inverse time tripping characteristics with automatic release secured through action of a combination thermal-magnetic trip element which shall be trip free of the handle and shall operate in response to an overload or short circuit. The thermal trip element shall hold on harmless momentary overload, but shall trip on sustained overload. On dangerous overload or short circuit, within the interrupting rating of the breaker, the magnetic trip shall instantly trip the circuit breaker without damage or injury to the circuit breaker.
- c. All circuit breakers shall be of the bolted type.
- d. The entire circuit breaker shall be enclosed in a molded bakelit case and shall be sealed to prevent tampering and unauthorized changes in calibration.
- e. Circuit breaker handles shall have three distinct positions "Off" - "On" - and "Tripped". When a circuit breaker opens on overload or short circuit, the operating handle shall automatically assume the "Tripped" position.
- f. Interrupting ratings shall be 10,000 ampere at 120 volts for frames up to 100 ampere and 42,000 ampere at 240 volts for frames up to 800 ampere.

6. Panelboard Mounting:

- a. Panelboards shall be set true and plumb in location as shown on the contract drawings. Top of panelboard enclosures shall not exceed six (6) feet above finished floor. Panelboards shall be flush mounted.
- b. Enclosures shall not be fastened to concrete or masonry surfaces with wooded or plastic plugs. Appropriate cadmium plated or galvanized steel bolts shall be used with expansion shields or other metallic type concrete insert for mounting on concrete or solid masonry walls. Bolt diameter shall be as required considering the size and weight of the completed panelboard and enclosure to provide adequate structural support.
- c. The contractor shall not use factory furnished knockouts with surface back boxes. The contractor shall punch or drill required openings and Myers type hubs shall be utilized. The contractor shall provide cabinet doors exceeding 40" in height with vertical bolt three point locking mechanisms.
- d. The contractor shall align the tops of cabinets in sight of each other at a uniform height. The contractor shall install cabinets (and other enclosure products) in plumb with the building construction. Flush enclosures shall be installed so that the trim will rest against the surrounding surface material and around the entire perimeter of the enclosure.
- e. Directories shall be neatly marked, indicating function or circuit as installation progresses. After all work is installed and prior to acceptance by the owner, all directories shall be neatly typed and installed indicating circuit functions. Designations and circuit locations shall conform with the panelboard schedules on the contract drawings, except as otherwise authorized by the engineer.

- f. The contractor shall provide directories identifying panelboards and indicating size of feeder (cable and conduit) serving panel, circuit numbers, and description of associated branch circuits including branch circuit trip and connected load at each circuit.

16.1.25 Supporting Devices:

1. Steel Supports:

- a. The contractor shall furnish and install structural steel supports for mounting and installing all electrical, lighting, and equipment furnished under this contract.
- b. Where the weight of equipment exceeds 50 pounds and is supported from walls, ceilings, columns and/or beams, such supporting steel sizes, methods and locations shall be submitted to the engineer for review.

2. Support Fastening and Locations:

- a. All equipment fastenings to columns, steel beams, and trusses shall be by beam clamps or welded. No holes shall be drilled in the steel. Where supports or hangers are required for heavy electrical equipment, and where required, additional sections shall be provided for a safe installation.
- b. All holes in hung ceilings for support rods, conduits and other equipment shall be made adjacent to bars where possible, to facilitate removal of ceiling panels.

16.1.26 Motor Controls:

1. General:

- a. UL listing is required for all factory fabricated assemblies. Individual components listing is also required.
- b. Compliance with UL-508, NEMA-IC-1, and applicable portions of J.I.C. Standards for Industrial Control is required.
- c. All equipment furnished shall be of one approved manufacturer, where possible. Acceptable manufacturers are Allen-Bradley, Square D or equal.

2. Construction:

- 1. All parts subject to wear, arcing damage, or electrical failure shall be easily removable.
- 2. Overload Protection: Provide melting alloy type for all motors including those with internal protection, of proper size to match the controller. Provide one sensing device per ungrounded motor lead. Exception: windings used only during motor starting and automatically disconnected with the motor is running may be unprotected. Units shall be of "standard", "slow", or "fast" response as required for the type motor and load per the suppliers, recommendations. Size heaters per manufacturer's table supplied with the starter for the actual motor full load current and enclosure indicated on the motor nameplates.

3. Provide auxiliary contacts of type (NO or NC) and rating as required by interlocking and/or automatic control system indicated in Section 15 and/or drawings.

3. Manual Starters:

- a. Fractional HP Type: Single phase, toggle operated unless scheduled key operated, full voltage, non-reversing, unless scheduled reversing or 2-speed, with thermal overload device and neon pilot light. Provide H-0-A or Fast-OFF-Slow or FWD-OFF-REV selector switch where scheduled or required by application. Allen-Bradley Bulletin #600, or equal.
- b. Integral HP type: polyphase, pushbutton operated with handle guard and lockoff, full voltage non-reversing unless scheduled reversing or 2-speed, with thermal overload device, neon pilot light(s) and auxiliary contacts (where scheduled or required). Allen-Bradley Bulletin #609, or equal.

4. Magnetic Starters:

1. General: Factory fabricated assembly of components listed within a single enclosure. Control circuit transformer with 120V AC secondary winding and fuse and auxiliary devices as shown on elementary diagrams, scheduled and/or as required for function indicated in Electrical Equipment and Control Schedule. Size per NEMA and UL Standards to match motor controlled.
2. Non-Reversing Full Voltage Starting (FVNR): Allen-Bradley Bulletin #706 or equal.
3. Multi-Speed Full Voltage Starting (FVMS): Furnish with overload relay, auxiliary relay, and pilot light for each speed. Allen -Bradley Bulletin #716 or equal.
4. Overload Relay: Polyphase type of proper size to match contactor.
5. Combination Magnetic Starter: Factory assembled of UL listed components within a single enclosure. Handle mechanism permanently connected to switch and installed on body of enclosure with interlock to prevent unauthorized opening on closing of door with switch on, provision for padlocking in off position, clear indication of switch position, and auxiliary switch where indicated on drawings.

Branch circuit protection: Manually operated quick-make, quick-break over-center, trip free, motor circuit protector with current limiter providing trip indication and single phase protection where required by available fault current. Adjustable trip range at least 3 to 1 with provision for limiting maximum setting per N.E. Code linear calibrated scale, and single adjuster for all poles.

16.1.27 Restoration of Surfaces:

1. Work Included: This Section covers the restoration of existing surfaces and related items which are damaged or disturbed as a result of the Contractor's operations.
2. Contractor's Responsibility:
 - a. General:

1. Except as otherwise specified or shown, grades, and surfaces shall be restored so as to be equal to or better than the original condition which existed at the time they were damaged or disturbed. The Contractor's obligation will not be considered as fulfilled until all restoration work has been approved by the Engineer and by public authorities having jurisdiction.
- b. Conflicting Requirement: If any part of this specification is in conflict with the requirements of a public authority or public utility having jurisdiction over the work described, then the public authority's requirement shall govern.

However, where this specification exceeds the public authority requirement, and is acceptable to the public authority or public utility, then this specification shall govern.

16.1.28 Permits, Fees, and Certification: The cost of procuring all permits, inspection services, fees for temporary and permanent electric services shall be included in the price bid under this specification.

Upon completion of the work, the Contractor shall obtain certificates of inspection and approval from the National Board of Fire Underwriters' or similar inspection organization having jurisdiction and shall deliver same to the Engineer and the Owner.

All material and equipment shall bear the inspection labels of Underwriters' Laboratories, if the material and equipment is of the class inspected by said laboratories.

Any paragraph of requirement in these specifications or drawings, deviating from the rules, requirements and specifications of the above organizations shall be invalid and their requirements shall hold precedent thereto. The Contractor shall be held responsible for adherence to all rules, requirements and specifications as set forth above. Any additional work or material necessary for adherence will not be allowed as an extra, but shall be included in the bid price. Ignorance of any rule, requirement, or specification shall not be allowed as an excuse for non-conformity. Acceptance by the Engineer does not relieve the Contractor from the expense involved for the correction of any errors which may exist in the drawings submitted or in the satisfactory operation of any equipment.

16.1.29 Inspection: The Contractor shall furnish all instruments and a qualified Engineer to properly perform all tests required. Written notice of all tests shall be given the Engineer at least two weeks in advance.

Unless waived in writing by the Engineer, all tests shall be made in the presence of a duly authorized representative of the Engineer. When the presence of such representative is so waived, sworn statements, in duplicate, of the tests made and the results thereof, shall be furnished to the Engineer by the Contractor.

All electrical circuits shall be tested to insure circuit continuity, insulation resistance, proper slicing, and freedom improper grounds.

Necessary adjustments and testing shall be made in cooperation with the respective manufacturers and other contractors when necessary. All tests shall be made in accordance with the latest standards of the ANSI, IPCEA, IEEE and NEMA.

1. Costs: Cost of all test shall be borne by this Contractor and shall be included in the contract price.

2. 600V and Below Equipment: Each panel shall be tested with mains disconnected from the feeder, branches connected, branch circuit breakers closed, all fixtures in place and permanently connected, lamps removed or omitted from the sockets, and all wall switches closed. Feeders shall be tested with the feeders disconnected from the panels. Each individual power circuit shall be tested at the panel with the power equipment connected for proper operation.

Megohmmeter tests of the insulation resistance of power feeders shall be conducted. The results will be accepted when the megohmmeter shows the insulation resistance to be not less than one megohm per 100 volts at 20°C using a 1000 volt megohmmeter

The grounding system shall have a resistance to ground of two ohms or less when measured by a megohmmeter or equivalent device.

16.1.30 Operational Tests: The equipment shall be given an operational test to determine that all components including motors, controls, protective and switching devices and auxiliary associated equipment are in operable condition and can function as described and shown on relevant specifications, operating instructions, and drawings.

After completion of work, the Contractor shall thoroughly test the entire electrical system, including electrical work required for instrumentation, control and power, and shall adjust electrical system as required.

The Contractor shall include in his work the providing of necessary factory trained supervision to check over equipment for proper functioning before putting the equipment into operation. This shall include establishing a simulated fault on checking out the coordination of the protective devices.

16.1.31 Documentation Procedures: Signed commitments are required. The transfer of electrical systems to Owner for operation will not proceed until guarantees, warranties, performance certifications, maintenance agreements and similar commitments to be signed by Contractor and other entities have been executed and transmitted to Engineer for placement in the owner's records.

The work of this paragraph is in addition to and does not supersede testing and adjusting specified in other sections of the specifications. The Contractor shall submit to the Engineer, test records, and reports for all testing. Megohmmeter testing (Insulation Resistance Test) of all incoming and outgoing cables, distribution and power panels, motor control centers, etc., shall be done after the cables are in place, and just prior to final termination.

The Contractor shall furnish all test equipment as required.

16.1.32 Closeout Procedures: General coordination is required. Close-out procedures shall be sequenced properly so that work will not be endangered or damaged, and so that every required performance will be fully tested and demonstrated.

System performance test runs are required. Test runs of electrical systems shall be coordinated with test runs of equipment served thereby.

A check of each item in each system shall be made to determine that it is set for proper operation. With Owner's Representative and Engineer present, the Contractor shall operate each system in a test run of appropriate duration to demonstrate compliance with performance requirements. During or following test runs, the Contractor shall make final corrections or where possible, including noise and vibration reductions, elimination of hazards, better response of controls, signals and alarms, and similar system performance improvements. The Contractor shall provide testing or inspection devices requested for

Engineer to permit observation of actual system performances and shall demonstrate that controls and items requiring service or maintenance area accessible.

Cleaning and lubrication is required. After final performance test run of each electrical system, the Contractor shall clean system both externally and internally, shall comply with manufacturer's instructions for lubrication of both power and hand operated equipment, and shall remove excess lubrication, touch up minor damage to factory-painted finishes and other painting specified as electrical work, and shall refinish work where damage is extensive.

General operating instructions are required. In addition, to specific training of Owner's operating personnel, specified in the individual sections, and in addition to preparation of written operating instructions and complied maintenance manuals specified elsewhere in these specifications, the Contractor shall provide general operating instructions for each operational system and equipment item of electrical work, and coordinate instructions with instruction for mechanical work, and other equipment where associated with electrical systems or equipment.

The Contractor shall describe each basic electrical system, and shall explain identification system, displayed diagrams, signals, alarms and audio visual provisions.

The Contractor shall describe interfaces with mechanical equipment, including interlocks, sequencing, startup, shutdown, emergency, safety, system failures, security and similar provisions.

The Contractor shall outline basic maintenance procedures and major equipment turnaround requirements, including adjustments to optimize output and efficiency of electrical systems.

The Contractor shall display and conduct a "thumb-through" explanation of maintenance manuals, record drawings, spare parts inventory, storage of extra materials, meter readings and similar service items.

1. Continued Systems Operations: The Contractor shall coordinate Owner's take over of electrical systems with takeover of mechanical systems, including the provision of skilled electrical operating and maintenance personnel until the time Owner's personnel take over operation of entire mechanical and electrical plant. The Contractor shall respond promptly with continued consultation and services (beyond takeover date) on electrical systems, matching required continued services on associated mechanical systems and equipment until the end of the warranty period.
2. Cleaning: As the work progresses and also before the completion and final acceptance of the work, the Contractor shall remove all rubbish and unused materials resulting from the work and shall leave the structures and grounds in a neat condition satisfactory to the Engineer. Prior to final acceptance, the Contractor shall also remove all temporary structures which he may have erected for his own use.

The Contractor will be responsible for safeguarding and protecting their own work, materials, tools, and equipment.

16.1.33 Guarantee: The following equipment is to be furnished under this section of the specifications and shall be guaranteed against defective materials, design, and workmanship for a period of one (1) year from the date of acceptance, either for beneficial use or final acceptance, whichever is earlier:

1. Disconnect Switches;
2. Control Wiring;
3. Receptacles & Switches;
4. Circuit Breakers;
5. Motor Starters.

16.1.34 Safety and Disconnect Switches:

1. Enclosed Switches - Heavy Duty: Provide enclosed switches with ratings and enclosure types as indicated on the drawings.

Applicable Standards are:

UL File #E4776 listing for use as enclosed switch and as service entrance switch.

UL 898 - Enclosed and dead front switches.

NEMA Standard KS-1-1990 for type HD switches.

Meet Federal Specification W-S-865C for switches type "HD".

Furnish "Heavy Duty" enclosed switches suitable for use with systems delivering 200,000 RMS symmetrical amperes of Fault Current. Furnish Class J or R fuses, except 00 Amperes and above furnish Class L fuses.

Switch shall have voidable dual cover interlock, padlockable cover latch and multiple padlock provision on handle.

Enclosed switches shall be Siemens Heavy Duty or approved equal by specifying engineer. Typical Catalog Number shall be: AN321, NRH321, F321SS, F321H, F321HCH, F321SSCH, F351, FR351, NF351, F351SS, NF351SS, NF351H, SN421, NRH421, F421, F651H, F651SS, NF651H and NF651SS.

2. Enclosed Switches - Mill Duty: Mill duty is an assigned reference to a UL listed heavy duty switch designed to exceed the normal UL requirements of heavy duty switches.

Applicable Standards are:

UL File #E4776 listing for use as enclosed switch and as service entrance switch.

UL 898 - Enclosed and dead front switches.

NEMA Standard KS-1-1990 for type HD switches.

Meet Federal Specification W-S-865C for switches type "HD".

Switch shall have welded seams, insulated shield on load and line side of switch, color code fuse ejector, over-center spring drive, positive handle indication, one piece metallic handle with hook-stick operator, double-pole double-throw auxiliary contacts, blown fuse indication lights, removable door, door seal, voidable door interlock, lockable door and multiple padlock provisions on handle.

Typical Catalog Numbers shall be: F221M, F221MW, F221MSS, F321M, F321MW, F321MSS, F351M, F351MW, F351MSS, NF351M, NF351MW, NF351MSS, F451M, F451MW, F451MSS and NF451MSS. Mill Duty enclosed switches shall be Siemens Mill Duty Switch or equal as approved by specifying engineer.

END OF SECTION 260501

SECTION 260510 – WIRING METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:

1.2 REFERENCES

- A. NFPA 70-93 -- National Electrical Code; National Fire Protection Association; 2008.
- B. Standard of Installation; National Electrical Contractors Association (NECA).

1.3 SUBMITTALS

- A. Project Record Documents:
 - 1. Coordination drawings.

1.4 QUALITY ASSURANCE

- A. Conform to NFPA 70.
- B. Conform to requirements of NECA "Standard of Installation" that do not conflict with regulatory requirements or requirements of contract documents.
- C. Furnish products listed by Underwriters Laboratories Inc. and classified as suitable for installed use and environmental conditions.

1.5 PROJECT CONDITIONS

- A. Review drawings to determine project conditions.
- B. Determine working clearance around and between construction elements such as beams, columns, walls, and ceilings.
- C. Determine access requirements around other work, including working clearances to mechanical equipment, controls, and electrical equipment.

1.6 COORDINATION

- A. Prepare coordination drawings and distribute to affected installers of related work.
 - 1. Indicate requirements for access openings in building finishes.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces intended to support products.
- B. Verify that each product conforms to regulatory requirements and to specification requirements.

3.2 PREPARATION

- A. Clean surfaces to receive work.
- B. Protect surrounding elements from work of this section.

3.3 WIRING METHODS

- A. Use specified wiring methods.
- B. Underground Locations:
- C. In or Under Slab-on-Grade:
- D. In Slab above Grade:
- E. Concealed Dry Interior Locations:
 - 1. Flexible metal conduit.
- F. Exposed Dry Interior Locations:
 - 1. EMT.

3.4 INSTALLATION

- A. Install products in compliance with manufacturer's instructions.
- B. Install accessories specified in this section.
- C. Maintain required headroom.

3.5 FIELD QUALITY CONTROL

- A. Correction of Defective Work:
 - 1. Replace wire and cable damaged during installation.
 - 2. Replace defective products.

END OF SECTION 260510

SECTION 260518 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2 and 3 control cables.

1.2 ACTION SUBMITTALS

- ##### A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- ##### A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- ##### A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- ##### B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2 Type XHHW-2.

2.2 CONNECTORS AND SPLICES

- ##### A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 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 NFPA 70.

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, Type XHHW-2, single conductors in raceway
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Coordinate "Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground" Paragraph below with Section 260543 "Underground Ducts and Raceways for Electrical Systems."
- E. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway, Type XHHW-2, single conductors in raceway.
- F. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway, Armored cable, Type AC.
- H. Coordinate "Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground" Paragraph below with Section 260543 "Underground Ducts and Raceways for Electrical Systems."
- I. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway,] Type XHHW-2, single conductors in raceway.

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.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum 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.

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after 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. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- B. Test and Inspection Reports: Prepare a written report 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.
- C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260518

SECTION 260519 – WIRE AND CABLE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wire.

1.2 REFERENCES

- A. NFPA 70-93 -- National Electrical Code; National Fire Protection Association; 2008.
- B. Standard of Installation; National Electrical Contractors Association (NECA).

1.3 SUBMITTALS

- A. Field test report for each inspection and test specified in this section, for information. Describe inspections and tests, list observations, indicate corrective action taken, and state conclusions and recommendations for future action.
- B. Project Record Documents:
 - 1. Coordination drawings.

1.4 QUALITY ASSURANCE

- A. Conform to NFPA 70.
- B. Conform to requirements of NECA "Standard of Installation" that do not conflict with regulatory requirements or requirements of contract documents.
- C. Furnish products listed by Underwriters Laboratories Inc. and classified as suitable for installed use and environmental conditions.

1.5 PROJECT CONDITIONS

- A. Review drawings to determine project conditions.
- B. Determine working clearance around and between construction elements such as beams, columns, walls, and ceilings.
- C. Determine access requirements around other work, including working clearances to mechanical equipment, controls, and electrical equipment.

1.6 COORDINATION

- A. Prepare coordination drawings and distribute to affected installers of related work.
 - 1. Indicate requirements for access openings in building finishes.

PART 2 - PRODUCTS

2.1 INSULATED WIRE AND CABLE

Interior Renovations/
Village of Woodbury Building Department
Highland Mills, NY

260519-1

#4.1523.01

- A. Conductor: Copper.
- B. Insulation:
 - 1. THHN/THW/XHHM
- C. Voltage: 600 volts.
- D. Insulation Color:
 - 1. 208 volt system: Blue-red-black-white.
 - 2. 480 volt system: Yellow-orange-brown-gray.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces intended to support products.
- B. Verify that each product conforms to regulatory requirements and to specification requirements.

3.2 PREPARATION

- A. Clean surfaces to receive work.
- B. Protect surrounding elements from work of this section.
- C. Clean raceways thoroughly before installing wires.

3.3 WIRING METHODS

- A. Use specified wiring methods.
- B. Underground Locations:
- C. In or Under Slab-on-Grade:
- D. In Slab above Grade:
- E. Concealed Dry Interior Locations:
- F. Exposed Dry Interior Locations:

3.4 INSTALLATION

- A. Install products in compliance with manufacturer's instructions.
- B. Install accessories specified in this section.
- C. Maintain required headroom.
- D. Identification:
 - 1. Use wire markers at each box and enclosure to identify conductors.
 - 2. Identify each feeder number with its designation shown on drawings.
 - 3. Identify each branch circuit conductor with panelboard and circuit number.

4. Identify each control circuit conductor with wire number shown on drawings.

3.5 FIELD QUALITY CONTROL

- A. Inspect wires and cables for physical damage.
- B. Insulation Resistance:
 1. Test each service and feeder circuit.
 2. Test each conductor with respect to ground and to its adjacent conductors.
 3. Apply 1000 volts dc test potential for 1 minute.
 4. Minimum insulation resistance: 2 megohms.
- C. Correction of Defective Work:
 1. Replace wire and cable damaged during installation.
 2. Replace defective products.

END OF SECTION 260519

SECTION 260526 – GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Requirements specified in this Section may be supplemented by requirements of other Sections.

1.02 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.
- C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Apache Grounding/Erco Inc.
 - 2. Boggs, Inc.
 - 3. Chance/Hubbell.
 - 4. Copperweld Corp.
 - 5. Dossert Corp.
 - 6. Erco Inc.; Electrical Products Group.
 - 7. Framatome Connectors/Burndy Electrical.
 - 8. Galvan Industries, Inc.
 - 9. Harger Lightning Protection, Inc.
 - 10. Hastings Fiber Glass Products, Inc.
 - 11. Heary Brothers Lightning Protection Co.
 - 12. Ideal Industries, Inc.
 - 13. ILSCO.
 - 14. Kearney/Cooper Power Systems.
 - 15. Korns, C. C. Co.; Division of Robroy Industries.
 - 16. Lightning Master Corp.
 - 17. Lyncole XIT Grounding.
 - 18. O-Z/Gedney Co.; a business of the EGS Electrical Group.
 - 19. Racor, Inc.; Division of Hubbell.
 - 20. Robbins Lightning, Inc.

21. Salisbury, W. H. & Co.
22. Superior Grounding Systems, Inc.
23. Thomas & Betts, Electrical.

2.02 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare, Solid-Copper Conductors: ASTM B 3.
- G. Assembly of Bare, Stranded-Copper Conductors: ASTM B 8.
- H. Bare, Tinned-Copper Conductors: ASTM B 33.
- I. Copper Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
- J. Copper Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- K. Tinned-Copper Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- L. Ground Conductor for Overhead Distribution: No. 4 AWG minimum, soft-drawn copper.
- M. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulated spacer.
- N. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items. Bolted type or exothermic-welded type, in kit form, selected per manufacturer's written instructions.

2.03 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad.
 1. Size: 3/4 by 120 inches in diameter.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
- D. Equipment Grounding Conductors: Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
 - 1. Install insulated equipment grounding conductors in feeders and branch circuits and receptacle circuits.
 - 2. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
 - 3. Air-Duct Equipment Circuits: Install an insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
- E. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- F. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- G. Metal Water Service Pipe: Provide 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 by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- H. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- I. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.
- J. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
- K. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.
- L. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to

- make contact points closer to 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.
 6. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
 7. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
 8. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
 9. Tighten screws and bolts for grounding and bonding 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.
 10. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
 11. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.02 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is indicated and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the 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. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each ground rod, ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results. Nominal maximum values are as follows:
 - a. Equipment Rated 500 kVA and Less: 10 ohms.

END OF SECTION 260526

SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.2 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.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 SUBMITTALS

- A. Product Data: For steel slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Equipment supports.
- C. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 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. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 6. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored 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 malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. 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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
- a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type 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.

2.2 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 Division 5 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. 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 single-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) 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, as permitted in 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 (90 kg).
- 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 (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 6. To Steel: Beam clamps (MSS 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 meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 5 Section "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 (100 mm) larger in both directions than supported unit.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3 Section "Cast-in-Place Concrete."
 - 1. .

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 (0.05 mm).
- 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

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Conduit.
 - 2. Wireway.
- B. Related Sections:
 - 1. Excavation and backfill: Division 2.
 - 2. Firestopping: Division 7.

1.2 REFERENCES

- A. ANSI C80.1 -- American National Standard for Rigid Steel Conduit - Zinc Coated.
- B. ANSI C80.3 -- American National Standard for Electrical Metallic Tubing - Zinc Coated; 1991.
- C. ANSI C80.5 -- American National Standard for Rigid Aluminum Conduit.
- D. NEMA FB 1 -- Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies; National Electrical Manufacturers Association.
- E. NEMA TC 2 -- Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80); National Electrical Manufacturers Association.
- F. NEMA TC 3 -- PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association.
- G. NFPA 70-93 -- National Electrical Code; National Fire Protection Association.
- H. Standard of Installation; National Electrical Contractors Association (NECA).
- I. UL 1 -- Standard for Flexible Metal Electrical Conduit; Underwriters Laboratories Inc.

1.3 SUBMITTALS

- A. Project Record Documents:
 - 1. Coordination drawings.

1.4 QUALITY ASSURANCE

- A. Conform to NFPA 70.
- B. Conform to requirements of NECA "Standard of Installation" that do not conflict with regulatory requirements or requirements of contract documents.
- C. Furnish products listed by Underwriters Laboratories Inc. and classified as suitable for installed use and environmental conditions.

1.5 PROJECT CONDITIONS

Interior Renovations/
Village of Woodbury Building Department
Highland Mills, NY

260533-1

#4.1523.01

- A. Review drawings to determine project conditions.
- B. Determine working clearance around and between construction elements such as beams, columns, walls, and ceilings.
- C. Determine access requirements around other work, including working clearances to mechanical equipment, controls, and electrical equipment.

1.6 COORDINATION

- A. Prepare coordination drawings and distribute to affected installers of related work.
 - 1. Indicate raceway routing and elevation.
 - 2. Indicate required separation of conduit from piping and heat generating sources.
 - 3. Indicate requirements for access openings in building finishes.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND FITTINGS

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Rigid Aluminum Conduit: ANSI C80.5.
- C. Electrical Metallic Tubing: ANSI C80.3 with set-screw or compression type fittings.
- D. Flexible Metal Conduit: UL 1; aluminum.
- E. Liquidtight Flexible Metal Conduit: UL 1; flexible metal conduit with flexible PVC jacket.
- F. Fittings and Conduit Bodies: NEMA FB 1.

2.2 NONMETALLIC CONDUIT

- A. Rigid Plastic Conduit: NEMA TC 2, Type EPC-40-PVC.
- B. Plastic Conduit Fittings: NEMA TC 3, PVC plastic.

2.3 WIREWAYS

- A. General-Purpose Type:
 - 1. Sheet metal flangeless wireway with screw cover.
 - 2. Finish: Manufacturer's standard.
- B. Oiltight Type:
 - 1. Sheet metal flangeless lay-in wireway with gasketed hinged cover and latch.
 - 2. Finish: Manufacturer's standard.
- C. Size: Indicated on drawings or as required to meet regulatory requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces intended to support products.
- B. Verify that each product conforms to regulatory requirements and to specification requirements.

3.2 PREPARATION

- A. Clean surfaces to receive work.
- B. Protect surrounding elements from work of this section.

3.3 RACEWAY APPLICATIONS

- A. Use specified wiring methods.
- B. Underground Locations:
 - 1. Rigid steel conduit.
- C. In or Under Slab-on-Grade:
 - 1. Rigid steel conduit.
 - 2. Rigid plastic conduit.
- D. In Slab above Grade:
 - 1. Rigid steel conduit.
 - 2. Electrical metallic tubing.
- E. Concealed Dry Interior Locations:
 - 1. Rigid steel conduit.
 - 2. Electrical metallic tubing.

3.4 INSTALLATION

- A. Install products in compliance with manufacturer's instructions.
- B. Install accessories specified in this section.
- C. Maintain required headroom.

3.5 RACEWAY INSTALLATION

- A. Conduit:
 - 1. Route exposed conduit perpendicular and parallel to building surfaces.
 - 2. Maintain adequate clearance between conduit and piping.
 - 3. Use appropriate conduit clamps and hangers to secure conduit to surfaces and supports.
 - 4. Group parallel conduits on common support rack. Construct rack for multiple conduits using steel channel. Construct rack to allow installation of 20 percent additional conduits, 2 conduits minimum.
 - 5. Do not fasten conduit with wire or perforated pipe straps.
 - 6. Use suitable fittings for terminating, connecting, and changing direction of conduit.
 - 7. Use suitable expansion and deflection fittings at building expansion joints.
 - 8. Provide pull string in each empty conduit longer than 30 inches.

3.6 FIELD QUALITY CONTROL

- A. Correction of Defective Work:

1. Replace wire and cable damaged during installation.
2. Replace defective products.

3.7 PROTECTION

- A. Install cap at each end of each installed empty conduit to prevent entrance of moisture and debris.

END OF SECTION 260533

SECTION 260534 – RACEWAYS AND BOXES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. See Division 2 Section "Underground Ducts and Utility Structures" for exterior ductbanks, manholes, and underground utility construction.
- C. See Division 7 Section "Through-Penetration Firestop Systems" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
- D. See Division 16 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
- E. See Division 16 Section "Wiring Devices" for devices installed in boxes.

1.02 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

1.03 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. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 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 manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 METAL CONDUIT AND TUBING

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. Alflec Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. EMT and Fittings: ANSI C80.3.

1. Fittings: Set-screw or compression type.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.03 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Certainteed Corp.; Pipe & Plastics Group.
6. Condux International.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; Division of Hubbell, Inc.
12. Spiraldut, Inc./AFC Cable Systems, Inc.
13. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. PVC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

E. LFNC: UL 1660.

2.04 METAL WIREWAYS

- A. Manufacturers:
 - 1. Hoffman.
 - 2. Square D.
- B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1 or 3R as applicable.
- C. Fittings and Accessories: Include 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. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- E. Wireway Covers: Hinged type.
- F. Finish: Manufacturer's standard enamel finish.

2.05 NONMETALLIC WIREWAYS

- A. Manufacturers:
 - 1. Hoffman.
 - 2. Lamson & Sessions; Carlon Electrical Products.
- B. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.
- C. Fittings and Accessories: Include 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. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.06 SURFACE RACEWAYS

- A. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.
 - 1. Manufacturers:
 - a. Butler Manufacturing Co.; Walker Division.
 - b. Enduro Composite Systems.
 - c. Hubbell, Inc.; Wiring Device Division.
 - d. Lamson & Sessions; Carlon Electrical Products.
 - e. Panduit Corp.
 - f. Walker Systems, Inc.; Wiremold Company (The).
 - g. Wiremold Company (The); Electrical Sales Division.
- B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.07 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet-PLM Division.
10. Spring City Electrical Manufacturing Co.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Floor Boxes: Cast metal, fully adjustable, rectangular.

F. Floor Boxes: Nonmetallic, nonadjustable, round.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

J. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC.

2. Concealed: Rigid steel or IMC.
 3. Underground, Single Run: RNC.
 4. Underground, Grouped: RNC.
 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 6. Boxes and Enclosures: NEMA 250, Type 4.
- B. Indoors:
1. Exposed: EMT .
 2. Concealed: EMT.
 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
 4. Damp or Wet Locations: Rigid steel conduit.
 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, nonmetallic.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- 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 embedded in or in contact with concrete.

3.02 INSTALLATION

- A. 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.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.

- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- I. Join raceways with fittings designed and approved for that purpose and make joints tight.
 - 1. Use insulating bushings to protect conductors.
- J. Tighten set screws of threadless fittings with suitable tools.
- K. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- L. 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.
- M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-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 at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- N. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- O. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

- P. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- Q. Set floor boxes level. Trim after installation to fit flush with finished floor surface.
- R. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.03 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260534

SECTION 260548.16 – SEISMIC CONTROLS 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. Restraint channel bracings.
 - 2. Restraint cables.
 - 3. Seismic-restraint accessories.
 - 4. Mechanical anchor bolts.
 - 5. Adhesive anchor bolts.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES/OSHPD or an agency acceptable to authorities having jurisdiction].
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
- B. Delegated-Design Submittal: For each seismic-restraint device.
 - 1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic forces required to select seismic restraints.
 - a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
 - 3. Seismic Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods,

and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

- c. Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES, OSHPD or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
- D. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
 - 1. Site Class as Defined in the IBC: **A**.
 - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: **II**

2.2 RESTRAINT CHANNEL BRACINGS

- A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

- A. Restraint Cables: ASTM A 492 stainless steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

- A. Hanger-Rod Stiffener Reinforcing steel angle clamped to hanger rod.
- B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.
- D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
- E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

- A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.6 ADHESIVE ANCHOR BOLTS

- A. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an evaluation service member of ICC-ES/OSHPD or an agency acceptable to authorities having jurisdiction.
- B. Indicate on Drawings, by details, schedules, or a combination of both, the locations where hanger rods for individual raceways, bus duct, cable trays, and hanger rods for trapeze hangers require hanger-rod stiffeners.

- C. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- D. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment and Hanger Restraints:
- B. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch
- C. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES/OSHPD or an agency acceptable to authorities having jurisdiction providing required submittals for component.
- D. Install cables so they do not bend across edges of adjacent equipment or building structure.
- E. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- G. Drilled-in Anchors:
 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre-stressed 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. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 5. Set anchors to manufacturer's recommended torque using a torque wrench.
 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
- B. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
- C. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 - 1. Test to 90 percent of rated proof load of device.
- D. Seismic controls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548.16

SECTION 260553 – ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 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.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- 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.

PART 2 - PRODUCTS

2.1 POWER 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. Self-Adhesive 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 adhesive tape for securing ends of legend label.

- D. 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.
- E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) 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. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 ARMORED AND 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 raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

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 raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) 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. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- D. Snap-Around Labels: 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.

- E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or 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 (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- D. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) 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. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.5 FLOOR MARKING TAPE

- A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white 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,.

2.7 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.

- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. 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 (6.4-mm) grommets in corners for mounting.
 - 3. Nominal size, 7 by 10 inches (180 by 250 mm).
- D. Metal-Backed, Butyrate Warning Signs:
 - 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
 - 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
 - 3. Nominal size, 10 by 14 inches (250 by 360 mm).
- E. 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 (915 MM)."
 - 3. Insert names and wording of warning signs or labels; e.g., arc-flash, multiple services and voltages, and others.

2.8 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
 - 1. Engraved legend with black letters on white face **<Insert colors>**.
 - 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 (10 mm).
- 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 (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.9 EQUIPMENT IDENTIFICATION LABELS

- A. 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 (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.
- B. 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 (10 mm).

- C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 9 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. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. 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 (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
- G. Painted Identification: Comply with requirements in Division 9 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. 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: Install labels at 30-foot (10-m) maximum intervals.
- B. 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. Emergency Power – Red Labels with White Letters
 2. Power – Black Labels with White Letters
- C. 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 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) 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.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- F. 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.
- G. 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.
- H. 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.

- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
 - 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.
- J. 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.
- K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.
- L. 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: Adhesive film label Self-adhesive, engraved, laminated acrylic or melamine label Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) 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.

END OF SECTION 260553

SECTION 262416 – PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes distribution and branch-circuit panelboards.

1.2 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard, including the following:
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following data:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, and current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. Listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
- C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
- D. Operation and maintenance data.

1.3 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. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Corp.; Cutler-Hammer Products.
 - 2. General Electric Co.; Electrical Distribution & Control Div.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D Co.

2.2 FABRICATION AND FEATURES

- A. Enclosures: Flush-mounted cabinets. NEMA PB 1, Type 1, suitable for environmental conditions at installed location.
- B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
- C. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
- D. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.
- E. Bus: Hard-drawn copper, 98 percent conductivity.
- F. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
- G. Panelboard Short-Circuit Rating:
 - 1. Fully rated to interrupt symmetrical short-circuit current available at terminals.
- H. Panelboards with Main Service Disconnect: Listed for use as service equipment.
- I. Spaces for Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- J. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
- K. Feed-through Lugs: Locate at opposite end of bus from incoming lugs or main device.

2.3 LOAD CENTERS

- A. Overcurrent Protective Devices: Bolt-in, full-module circuit breakers.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

- B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike, door-in-door construction.

2.5 DISTRIBUTION PANELBOARDS

- A. Doors: Front mounted, door-in-door construction and secured with vault-type latch with tumbler lock; keyed alike.
- B. Branch overcurrent protective devices shall be one of the following:
 - 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
 - 2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.6 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Application Listing: Appropriate for application; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - 3. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
 - 1. Install surface mounted unless otherwise indicated.
- B. Mounting Heights: Top of trim 74 inches above finished floor, unless otherwise indicated.
- C. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- D. Install filler plates in unused protective device spaces.
- E. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Basic Electrical Materials and Methods."

- B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.
- C. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

3.3 FIELD QUALITY CONTROL

- A. Testing and Inspection: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each electrical test and visual and mechanical inspection indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers.
 - 2. Test insulation resistance of panelboard bus with a megohmmeter, and ground continuity of cabinet and ground bus. Reject buses with insulation resistance less than 2 megohms.
 - 3. Correct defective and malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- B. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:
 - 1. Measure as directed during period of normal system loading.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
 - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
 - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.
- C. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.
 - 1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262713 – ELECTRICITY METERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes equipment for electricity metering.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts and wiring diagrams.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data. In addition to items specified in Division 1 include the following:
 - 1. Application and operating software documentation.
 - 2. Software licenses.
 - 3. Software service agreement.
 - 4. Hard copies of manufacturer's operating specifications, design user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy Submittal.

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.

1.6 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 - 1. Provide 30 days' notice to the Authority to allow scheduling and access to system and to allow the Authority to upgrade his computer equipment if necessary.

PART 2 - PRODUCTS

2.1 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY

- A. Meters will be furnished by utility company.

- B. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.
- C. Meter Sockets: Comply with requirements of electrical-power utility company.
- D. Meter Sockets: Steady-state and short-circuit current ratings shall meet indicated circuit ratings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA 1.
- B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.
- C. Install modular meter center according to NECA 400 switchboard installation requirements.
- D. Comply with requirements for identification specified in Division 26.
 - 1. Series Combination Warning Label: Self-adhesive type, with text as required by NFPA 70.
 - 2. Equipment Identification Labels: Adhesive film labels with clear protective overlay. For residential meters, provide an additional card holder suitable for typewritten card with occupant's name.

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Connect a load of known kilowatt rating, 1.5 kW minimum, to a circuit supplied by metered feeder.
 - 2. Turn off circuits supplied by metered feeder and secure them in off condition.
 - 3. Run test load continuously for eight hours minimum, or longer, to obtain a measurable meter indication. Use test-load placement and setting that ensures continuous, safe operation.
 - 4. Check and record meter reading at end of test period and compare with actual electricity used, based on test-load rating, duration of test, and sample measurements of supply voltage at test-load connection. Record test results.
- C. Electricity metering will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 262713

SECTION 262725 – WIRING CONNECTIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Boxes.
 - 2. Service fittings.
 - 3. Wiring devices.
 - 4. Multioutlet assembly.
 - 5. Equipment connections.

1.2 REFERENCES

- A. NEMA OS 1 -- Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association.
- B. NEMA WD 1 -- General Requirements for Wiring Devices; National Electrical Manufacturers Association.
- C. NEMA WD 6 -- Wiring Devices--Dimensional Requirements; National Electrical Manufacturers Association; 1988.
- D. NFPA 70-93 -- National Electrical Code; National Fire Protection Association; 2008.
- E. Standard of Installation; National Electrical Contractors Association (NECA).

1.3 SUBMITTALS

- A. Product data for each wiring device specified in this section.
- B. Product data for each service fitting specified in this section.
- C. Product data for each multioutlet assembly specified in this section.
- D. Manufacturer's qualification statement, for information.
- E. Project Record Documents:
 - 1. Coordination drawings.

1.4 QUALITY ASSURANCE

- A. Conform to NFPA 70.
- B. Conform to requirements of NECA "Standard of Installation" that do not conflict with regulatory requirements or requirements of contract documents.
- C. Furnish products listed by Underwriters Laboratories Inc. and classified as suitable for installed use and environmental conditions.

1.5 QUALIFICATIONS

- A. Manufacturer Qualifications: A company manufacturing products of this section which have performed in a satisfactory manner under comparable conditions for a period of 5 years.

1.6 PROJECT CONDITIONS

- A. Review drawings to determine project conditions.
- B. Determine working clearance around and between construction elements such as beams, columns, walls, and ceilings.
- C. Determine access requirements around other work, including working clearances to mechanical equipment, controls, and electrical equipment.
- D. Locations of outlets indicated on drawings are approximate unless dimensioned. Determine exact locations before roughing in raceway.

1.7 COORDINATION

- A. Use manufacturer's instructions and data to determine rough-in requirements and locations of products connected to electrical wiring.
- B. Prepare coordination drawings and distribute to affected installers of related work.
 - 1. Indicate requirements for access openings in building finishes.

PART 2 - PRODUCTS

2.1 OUTLET AND DEVICE BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

2.2 WALL SWITCHES

- A. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
 - 1. Arrow Hart Division/Cooper Industries.
 - 2. GE Wiring Devices.
 - 3. Hubbell Incorporated/Wiring Device Division.
 - 4. Leviton Manufacturing Company, Inc.
 - 5. Pass & Seymour/Legrand Wiring Devices Division.
- B. Single pole wall switch:
 - 1. Description: NEMA WD 1, general duty snap switch.
 - 2. Voltage: 120-277 volts, ac only.
 - 3. Rating: 20 amperes.
 - 4. Handle type: Rocker.
 - 5. Handle color: Ivory.

6. Wall plate: Plastic, to be selected

2.3 RECEPTACLES

- A. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
 1. Arrow Hart Division/Cooper Industries.
 2. GE Wiring Devices.
 3. Hubbell Incorporated/Wiring Device Division.
 4. Leviton Manufacturing Co., Inc.
 5. Pass & Seymour/Legrand Wiring Devices Division.
- B. Duplex Convenience Receptacle:
 1. Description: NEMA WD 1, general duty type.
 2. Device color: Ivory plastic.
 3. Configuration: NEMA WD 6, type 5-20.
 4. Wall plate: Plastic, to match device color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces intended to support products.
- B. Verify that each product conforms to regulatory requirements and to specification requirements.
- C. Verify locations of outlets before roughing in.

3.2 PREPARATION

- A. Clean surfaces to receive work.
- B. Protect surrounding elements from work of this section.

3.3 INSTALLATION

- A. Install products in compliance with manufacturer's instructions.
- B. Install accessories specified in this section.
- C. Maintain required headroom.

3.4 WIRING CONNECTIONS

- A. Make wiring connections in locations that ensure access or provide access panel using materials and methods specified in Division 8.

- B. Fasten conduit to boxes in wet locations using conduit hubs.
- C. Use splice and tap devices compatible with conductor material.
- D. Provide closures on unused openings in boxes.
- E. Outlet and Device Boxes:
 - 1. Install at heights indicated on drawings.
 - 2. Position recessed outlets carefully to allow for surface finish thickness.
 - 3. Separate outlets on both sides of walls by at least 6 inches.
- F. Equipment Connections:
- G. Examine electrical outlets to verify proper location.
- H. Examine branch circuit wiring to verify suitability.
 - 1. Install disconnect switches where indicated.
 - 2. Make wiring connections to equipment using devices and methods recommended by equipment manufacturer.
 - 3. Use conductor insulation with suitable rating for equipment connection.
- I. Paint boxes and enclosures using materials and methods specified in Division 9.
 - 1. Fire alarm: red.

3.5 COMMISSIONING

- A. Verify that products connected to wiring system are properly bonded to ground.
- B. Inspect wire connections for proper tightness.
- C. Verify size of overcurrent protection devices.
- D. Verify that wiring connections conform to manufacturer's instructions.
- E. Verify that motor rotation is correct.
- F. Operate electrical system to allow placing connected equipment into operation.

3.6 FIELD QUALITY CONTROL

- A. Receptacle Connections: Test each receptacle for proper connection.
- B. Correction of Defective Work:
 - 1. Replace defective products.

3.7 CLEANING

- A. Restore damaged corrosion-resistant coatings.

END OF SECTION 262725
262725-4

SECTION 262726 – WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Single- and double-pole snap switches and dimmer switches.

1.02 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.
- D. Field quality-control test reports.

1.03 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. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wiring Devices:
 - a. Bryant Electric, Inc./Hubbell Subsidiary.
 - b. Eagle Electric Manufacturing Co., Inc.
 - c. Hubbell Incorporated; Wiring Device-Kellems.
 - d. Leviton Mfg. Company Inc.
 - e. Pass & Seymour/Legrand; Wiring Devices Div.
 - 2. Multioutlet Assemblies:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Wiremold Company (The).

2.02 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
- B. Straight-Blade and Locking Receptacles: General-Duty grade.
- C. Straight-Blade Receptacles: Hospital grade.
- D. GFCI Receptacles: Straight blade, non-feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- deep outlet box without an adapter.

2.03 SWITCHES

- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
- B. Snap Switches: General-Duty grade, quiet type.
- C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
 - 1. Switch: 20 A, 120/277-V ac.
 - 2. Receptacle: NEMA WD 6, Configuration 5-15R.

2.04 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.05 FINISHES

- A. Color:
 - 1. Wiring Devices Connected to Normal Power System: Ivory, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.

- B. 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.
- C. Remove wall plates and protect devices and assemblies during painting.
- D. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.02 IDENTIFICATION

- A. Comply with Division 16 Section "Basic Electrical Materials and Methods."
 - 1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with white -filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.03 CONNECTIONS

- A. Ground equipment according to Division 16 Section "Grounding and Bonding."
- B. Connect wiring according to Division 16 Section "Conductors and Cables."

3.04 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 262726

SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Enclosed switches.
 - 2. Enclosed circuit breakers.
 - 3. Fuses.
- B. Related Sections:
 - 1. Electrical basic materials and methods: Elsewhere in Division 16.

1.2 REFERENCES

- A. NEMA AB 1 -- Molded Case Circuit Breakers and Molded Case Switches.
- B. NEMA FU 1 -- Low Voltage Cartridge Fuses.
- C. NEMA KS 1 -- Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- D. NEMA 250 -- Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NFPA 70 -- National Electrical Code; National Fire Protection Association; 2008.
- F. Standard of Installation; National Electrical Contractors Association (NECA).

1.3 SUBMITTALS

- A. Product data, for all products specified in this section.

1.4 QUALITY ASSURANCE

- A. Conform to NFPA 70.
- B. Furnish products listed by Underwriters Laboratories Inc., classified as suitable for installed use and environmental conditions.

1.5 QUALIFICATIONS

- A. Manufacturer Qualifications: A company manufacturing products of this section which have performed in a satisfactory manner under comparable conditions for a period of 5 years.

1.6 PROJECT CONDITIONS

- A. Review drawings to determine project conditions.
- B. Determine working clearance around and between construction elements such as beams, columns, walls, and ceilings.
- C. Determine access requirements around other work, including working clearances to mechanical

equipment and controls.

- D. Determine spaces reserved for electrical equipment.
- E. Locations of distribution equipment indicated on drawings are approximate unless dimensioned. Determine exact location before roughing in supports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
 - 1. Siemens Energy & Automation, Inc.
 - 2. Square D Company.

2.2 ENCLOSED SWITCHES

- A. Switch Assemblies: NEMA KS 1, heavy duty type.
- B. Fuse Clips (larger than 600 amperes): Class L.
- C. Fuse Clips: Match fuse specified for application.
- D. Wiring Terminations: Match conductor materials and sizes indicated on drawings.
- E. Enclosure: NEMA KS 1.
 - 1. Type 1 general purpose enclosure: Dry indoor locations unless indicated otherwise.

2.3 ENCLOSED CIRCUIT BREAKERS

- A. Molded Case Circuit Breakers: NEMA AB 1.
- B. Accessories:
 - 1. Undervoltage trip.
- C. Enclosure: NEMA AB 1.
 - 1. Type 1 general-purpose enclosure: Dry indoor locations unless indicated otherwise.

2.4 FUSES

- A. Provide products complying with requirements of the contract documents and made by a single manufacturer.
- B. Dimensions and Performance Characteristics: Conform to NEMA FU 1.
- C. Ratings: Current ratings as indicated; voltage ratings as required by circuit characteristics.
- D. Characteristics and Dimensions: Class RK1.
 - 1. Application: Use where indicated on drawings.
- E. Spare Fuses: Furnish 2 of each rating and type.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces intended to support products.
- B. Examine each product prior to installation to determine conformance to regulatory requirements and specification requirements.
- C. Correct any unsatisfactory conditions before installing products of this section.

3.2 PREPARATION

- A. Clean surfaces to receive work.
- B. Protect surrounding elements from work of this section.

3.3 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install accessories specified in this section.
- C. Install fuses in each switch.
- D. Support products in accordance with NECA "Standard of Installation."
- E. Provide fasteners and anchors as specified in section covering basic materials and methods.
- F. Mounting Heights: Conform to NECA "Standard of Installation" except where height is specified or indicated on drawings.
- G. Coordinate installation of recessed cabinets with firestopping specified in Division 7. Patch around cabinet and install flush trim to cover wall opening.
- H. Provide grounding and bonding as specified in section covering basic materials and methods.
- I. Interface installation with other products to ensure adequate working clearance around equipment.

3.4 COMMISSIONING

- A. Inspect products specified in this section to observe physical damage, proper anchorage, and proper bonding connections to equipment grounding conductor.
- B. Verify proper size of overcurrent protection devices.
- C. Verify proper tightness of bolted connections.
- D. Inspect plastic insulators and cases for cracks and other defects.
- E. Verify that wiring connections conform to manufacturer's instructions.

- F. Place products into operation in accordance with manufacturer's instructions.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and demonstrations required by the governing authority.

3.6 CLEANING

- A. Clean, using materials and methods recommended by product manufacturer.
- B. Remove dust and debris from inside of enclosures.
- C. Clean finishes to remove dust and dirt.
- D. Touch up scratches in unfinished surfaces to restore corrosion resistance.
- E. Touch up scratches in finished surfaces to restore finish.
- F. Clean electrical parts to remove dust, grease, and other materials that are harmful or conductive.

END OF SECTION 262816

SECTION 265100 – 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 luminaires.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Luminaires supports.

- B. Related Sections:

- 1. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

- A. BF: Ballast factor.
- B. CCT: Correlated color temperature
- C. CRI: Color-rendering index.
- D. CU: Coefficient of utilization
- E. LER: Luminaire efficacy rating.
- F. Luminaire: Complete lighting fixture, including ballast housing if provided.
- G. RCR: Room cavity ratio.

1.4 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.
 - 3. Driver and diodes factor.
 - 4. Energy-efficiency data.

5. Life, output, CCT, CRI, lumens and energy-efficiency data for luminaires.
 6. Photometric data, in IESNA format, based on laboratory tests of each luminaire type, outfitted with accessories identical to those indicated for the luminaires as applied in this Project. Provide conversion factors for all luminaire data if not the same as supplied for this project.
- B. Shop Drawings: For nonstandard or custom luminaires. 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. Coordination Drawings: Reflected ceiling plan(s), drawn to scale, on which luminaires, suspension system, construction that penetrates ceilings or is supported by them and other details are shown. Coordinate the following items, as a minimum, with each other, using input from Installers of the items involved:
1. Lighting fixtures.
 2. Suspended ceiling components.
 3. Structural members to which suspension systems for lighting fixtures will be attached.
 4. Other items in finished ceiling including the following:
 - a. Air outlets and inlets.
 - b. Speakers.
 - c. Sprinklers.
 - d. Smoke and fire detectors.
 - e. Occupancy sensors.
 - f. Access panels.
 - g. Ceiling mounted projectors
 - h. Partitions and millwork that penetrate the ceiling or extends to within one foot of the plane of the luminaires.
 5. Perimeter moldings.
- D. Product Certificates: For each type of ballast for dimmer-controlled fixtures, from manufacturer.
- E. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.
- F. Field quality-control reports.
- G. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
- H. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

- 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 NFPA 70.
- D. Provide specified manufacturer or approved substitute manufacturer listed in Fixture Schedule.

1.6 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies. Coordinate the following items, as a minimum, with each other, using input from Installers of the items involved:
 - 1. Lighting fixtures.
 - 2. Suspended ceiling components.
 - 3. Structural members to which suspension systems for lighting fixtures will be attached.
 - 4. Other items in finished ceiling including the following:
 - a. Air outlets and inlets.
 - b. Speakers.
 - c. Sprinklers.
 - d. Smoke and fire detectors.
 - e. Occupancy sensors.
 - f. Access panels.
 - g. Ceiling mounted projectors
 - h. Partitions and millwork that penetrate the ceiling or extends to within one foot of the plane of the luminaires.

1.7 WARRANTY

- A. Special Warranty for Emergency Luminaires 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 Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
 - 2. Completion.
- B. Special Warranty for LED: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: Ten year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In the Luminaire Schedule where titles below are column or row headings that introduce lists or are added in notes for particular luminaire types, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 2. Basis-of-Design Product: The design for each luminaire is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by another manufacturer equal to the specified. Provide manufacturers data sheets and point-to-point calculations for the substituted luminaires.

2.2 LUMINAIRES,, GENERAL REQUIREMENTS

- A. Recessed Luminaires: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
1. Aluminum or steel housing; finish.as per luminaire schedule on plans
- B. LED Luminaires: Comply with UL 1598. .
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally when secured in operating position.
- F. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
1. White Surfaces: 85 percent.
 2. Specular Surfaces: 83 percent.
 3. Diffusing Specular Surfaces: 75 percent.
 4. Laminated Silver Metallized Film: 90 percent.
- G. Diffusers and Globes:
1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless different thickness is indicated.
 - b. UV stabilized.
 2. Glass: Annealed crystal glass, unless otherwise indicated.

2.3 EXIT SIGNS

- A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
 - 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - f. Remote Test: Switch in hand-held 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.

2.4 EMERGENCY LED BATTERY UNITS

- A. Description: Self-contained units complying with UL 924.
 - 1. Battery: Sealed, maintenance-free, lead-acid type.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. 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.
 - 4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - 5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - 6. Integral Time-Delay Relay: Holds unit on for fixed interval of 10 minutes when power is restored after an outage.
 - 7. Remote Test: Switch in hand-held 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.

PART 3 - PRODUCTS

3.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7**

3.2 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. Recessed Fixtures: Comply with NEMA LE 4.
- C. CRI of minimum 80 ; CCT of 3500 K
- D. Rated lamp life of minimum **50,000** hours.
- E. LED dimmable from 100 percent to 0 percent of maximum light output.
- F. Internal driver.
- G. Nominal Operating Voltage – see Luminaire Schedule on plans.
- H. Housings:

PART 4 - EXECUTION

4.1 INSTALLATION

- A. Luminaires: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Luminaires in or on Grid-Type Suspended Ceilings: Use grid as a support element.
 - 1. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 - 2. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
 - 3. Install at least two independent support rods or wires from structure to a tab on lighting fixture. Wires or rods shall have breaking strength of the weight of fixture at a safety factor of 3.
- C. Suspended Luminaires Support:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

- 3. Do not use grid as support for pendant luminaires. Provide support wires or rods connected to building structure.
- D. Adjust aimable luminaires to provide required light intensities.
- E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

4.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265100

SECTION 265119 – LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior solid-state luminaires that use LED technology.
 - 2. Lighting fixture supports.

1.2 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.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, arranged by designation.
- 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. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved:
- B. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of luminaire.

- D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Minimum Ten year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7**

2.2 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.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Recessed Fixtures: Comply with NEMA LE 4.
- E. CRI of minimum 80 ; CCT of 3500 K
- F. Rated lamp life of minimum **50,000** hours.
- G. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- H. Internal driver.
- I. Nominal Operating Voltage – see Luminaire Schedule on plans.
- J. Housings:
 - 1. Aluminum or steel housing; finish.as per luminaire schedule on plans

2.3 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Division 26 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, as per manufacturer's specifications.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Aircraft cable shall be 1/8 inch.

PART 3 - EXECUTION

3.1 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: Sized and rated for luminaire weight.
- E. Flush-Mounted Luminaire Support: Secured to outlet box.
- F. Wall-Mounted Luminaire Support:
 - 1. Attached to structural members in walls.
 - 2. Do not attach luminaires directly to gypsum board.
- G. Ceiling-Mounted Luminaire Support:
 - 1. Ceiling mount with two minimum 5/32-inch diameter aircraft cable supports adjustable to 36 inches.
- 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 **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.
 - 2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
- J. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26.

3.2 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.

END OF SECTION 265119

SECTION 270500 – COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves for pathways and cables.
 - 2. Sleeve seals.
 - 3. Grout.
 - 4. Common communications installation requirements.

1.2 SUBMITTALS

- A. Product Data: For sleeve seals.
- B. Warranty: Provide manufacturer's system warranty against electrical or mechanical defects for 2 years from date of final acceptance.

PART 2 - PRODUCTS

2.1 TELE-POWER POLES

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mono-Systems, Inc.
 - 2. Panduit Corp.
 - 3. Wiremold/Legrand
 - 4. Or approved equal
- B. Material: Aluminum with clear anodized finish.
- C. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

2.2 SLEEVES FOR PATHWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).

- b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.3 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
 - 1. Available Manufacturers: Subject to compliance with requirements. Subject to compliance with requirements, provide or comparable product by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - e. Or approved equal
 - 2. Sealing Elements: Interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
 - 3. Pressure Plates: Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Utilize 4" sleeves to provide clear space between sleeve and pathway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7.
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7.
- K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using 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.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7.

END OF SECTION 270500

SECTION 270526 – GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Provide all labor, materials, tools, installation equipment, and test equipment required for the complete installation of grounding and bonding for telecommunications systems within the structure.

1.2 REFERENCES

- A. ANSI-J-STD-607-A-2002 – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
- B. National Fire Protection Association (NFPA – 70), National Electrical Code (NEC)
- C. ANSI T1.333-2001 – Grounding and Bonding of Telecommunications Equipment

1.3 QUALITY ASSURANCE

- A. The materials and their installation shall conform to the requirements of ANSI-J-STD-607-A-2002 and the National Electrical Code
- B. Use adequate numbers of skilled work-persons thoroughly trained and experienced on the necessary crafts and completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

PART 2 – PRODUCTS

2.1 STANDARD

- A. All materials used in the installation shall be new and shall comply in weight, size and composition as required by manufacturer and shall be labeled or listed by Underwriters Laboratories Inc. for use in electrical grounding.

2.2 ACCEPTABLE MANUFACTURES

- 1. Harger Lightning & Grounding
- 2. Or Approved Equal

2.3 TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB)

- A. The TMGB shall be ¼”T x 4”W x 12”L copper ground bar.
 - 1. The TMGB shall be predrilled with holes for use with standard sized lugs.
 - 2. The TMGB shall be UL listed and meet the requirements of ANSI-J-STD-607-A-2002
 - 3. The TMGB shall be sized as above or lengthened to meet requirements of the immediate application with consideration for future growth.

2.4 TELECOMMUNICATIONS GROUNDING BUSBAR (TGB)

- A. The TGB shall be a ¼" T x 2" W x 12" L copper ground bar.
 - 1. The TMGB shall be predrilled with holes for use with standard sized lugs.
 - 2. The TMGB shall be UL listed and meet the requirements of ANSI-J-STD-607-A-2002.
 - 3. The TMGB shall be sized as above or lengthened to meet requirements of the immediate application with consideration for future growth.

2.5 CONDUCTORS

- A. Conductors shall be stranded copper conductors with green insulation
 - 1. Minimum conductor size No. 6 AWG.
 - 2. Conductors shall be sized at 2 kcmil per linear foot of conductor length. For example: A conductor 25 feet in length shall be No. 2 AWG (66,360 cmil). A conductor 100 feet in length shall be No. 4/0 AWG (211,600 cmil)
 - 3. Insulation shall be rated for the environment where it is installed.

2.6 CONNECTOR LUGS

- A. Lugs for connecting to the TMGB and TGB shall be UL Listed two-hole, long barrel, electro tin-plated compression lugs with inspection port.
 - 1. Antioxidant joint compound shall be applied to the contact areas.
 - 2. Lugs shall be secured to the ground bars with ¼" minimum stainless steel hex head cap screws with stainless steel washers, lock washers and nuts.

2.7 EXOTHERMIC WELDED CONNECTIONS

- A. Exothermic Welded connections shall be.
 - 1. Weld types BE shall be made to the ground bars using appropriate size weld metal.
 - 2. Weld types VA, VD, or VU shall be made to structural steel framework

PART 3 – EXECUTION

3.1 INSTALLATION

- A. The telecommunications main grounding bar (TMGB) is a dedicated extension of the building grounding electrode system for the telecommunications system. The TMGB should be located near the telecommunications service entrance and the electric service entrance.
 - 1. The TMGB shall be connected to the main electric service entrance panel ground or the branch electric panel ground that serves the telecommunications equipment.
 - 2. The TMGB shall be located to minimize the length of the bonding conductor for telecommunications from the TMGB to the electric service ground.
 - 3. The bonding conductor for telecommunications shall be at least the same size as the telecommunications backbone (TBB) conductor.
 - 4. The TMGB shall serve telecommunications equipment that is located in the same room or space.

5. Connections to the TMGB shall be made by exothermic welding or by listed two-hole compression lugs.
 6. All metal conduits or raceways for telecommunications cabling located within the same room or space as the TMGB shall be bonded to the TMGB.
 - a. Metal conduits 1" diameter and larger shall be bonded using electro tin-plated pipe clamps.
 - b. Metal conduits less than 1" diameter shall be bonded using electro tin-plated conduit bonding clamps.
 - c. Metal cable trays shall be bonded using electro tin-plated cable tray bonding clamps.
 - d. Bonding surface areas shall be cleaned to bare metal removing all paint, etc. The contact area shall be protected from corrosion using antioxidant joint compound.
 7. Where an electric power panel for telecommunications equipment is located in the same room or space as the TMGB, the panel ground bus or panel enclosure shall be bonded to the TMGB.
 8. The TMGB shall be located in an area that is accessible to telecommunications personnel
- B. The telecommunications backbone (TBB) is a conductor that originates at the TMGB and extends throughout the building interconnecting all telecommunications grounding busbars (TGBs) with the TMGB.
1. The TBB shall be a copper conductor. The minimum size of the conductor shall be No. 6 AWG. The size of the conductor shall be increased 2 kcmil per linear foot as the length of the TBB increases. For example: A TBB 25 feet in length shall be No. 2 AWG (66,360 cmil). A TBB 100 feet in length shall be No. 4/0 AWG (211,600 cmil)
 2. The TBB conductors should be installed without splices. Where splices are necessary, the number of splices should be minimized and located in accessible telecommunications spaces. Splices shall be made using exothermic welding, listed irreversible compression connectors or equivalent.
 3. The building water piping system shall not be used as a TBB.
 4. Metallic cable shields or metallic conduits shall not be used as a TBB.
- C. A telecommunications grounding busbar (TGB) shall be provided in each area where telecommunications equipment is located. The TGB is the grounding connection point for telecommunications systems and equipment in each separate area.
1. The TGBs shall be connected to the TMGB via the TBB conductor.
 2. The TBB and other TGBs within the same area shall be bonded to the TGB with a conductor the same size as the TBB.
 3. The bonding conductor between the TBB and the TGB shall be continuous and routed in the shortest straight-line path possible.
 4. Connections to the TGB shall be made by exothermic welding or by listed two-hole compression lugs.
 5. All metal conduits or raceways for telecommunications cabling located within the same room or space as the TGB shall be bonded to the TGB.
 6. Where an electric power panel for telecommunications equipment is located in the same room or space as the TGB, the panel ground bus or panel enclosure shall be bonded to the TGB.

- D. Where there are multiple telecommunications rooms or spaces with multiple TBBs, the TBBs shall be interconnected with a Grounding Equalizer (GE) conductor at the TGBs.
 - 1. Welding.
 - 2. In structural steel frame buildings, where the steel framework is accessible The GE shall be sized as specified for the TBB.
- E. Connections of the GE to the TGBs shall be made by exothermic within the room; the TMGB and each TGB shall be bonded to the structural steel frame using a minimum No. 6 AWG conductor.
 - 1. Connections to the structural steel frame shall be made by exothermic welding. The area of contact on the steel frame shall be cleaned to bare metal removing all paint and mill scale. The contact area shall be protected from corrosion using antioxidant joint compound.
 - 2. Where the structural steel frame is external to the room and is accessible, the structural steel should be bonded to the TGB or the TMGB using a minimum No. 6 AWG conductor.

END OF SECTION 270526

SECTION 270528 – PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF SPECIFICATION

- A. This section includes the minimum requirements for the following: EMT conduit J-Hooks Threaded Rod Cover Stackable Cable Rack Spacers Cable Management Wireless Access Boxes Fire Stopping Materials Floor Boxes.

1.2 SUBMITTALS

- A. As-Built Drawings

1.3 QUALITY ASSURANCE

- A. All installation work for the interior telecommunications pathways shall be performed in a neat and workmanlike manner.
- B. Equipment and materials shall be of the quality and manufactures indicated. The equipment specified is based on the acceptable manufacturers listed. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified.
- C. Materials and work specified herein shall comply with the applicable requirements of:
 - 1. ANSI/NFPA 70 – National Electrical Code including; but not limited to, the following articles:
 - a. 250 – Grounding
 - b. 300 – Wiring Methods
 - c. 314 – Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; Fittings; and Manholes
 - d. 358 – Electrical Metallic Tubing: Type EMT
 - e. 386 – Surface Metal Raceways
 - f. 770 – Optical Fiber Cables and Raceways
 - 2. ANSI/TIA/EIA-568-B.1 – Commercial Building Telecommunications Cabling Standard – Part 1: General Requirements, including applicable addendum
 - 3. ANSI/TIA/EIA-569-A – Commercial Building Standard for Telecommunications Pathways and Spaces, including applicable addendum
 - 4. ANSI/TIA/EA-606 – Administration Standard for Telecommunications Infrastructure of Commercial Buildings
 - 5. ANSI/TIA/EIA-607 – Commercial Building Grounding and Bonding Requirements for Telecommunications
 - 6. BICSI Telecommunications Distribution Methods Manual

1.4 FUNCTIONAL SYSTEM DESCRIPTION

- A. Refer to scaled Technology (T) drawings for lengths of cable runs.

PART 2 - PRODUCTS

2.1 EMT CONDUIT AND OUTLET BOXES

- A. Electrical Metallic Tubing (EMT)

1. Electro-galvanized steel tubing 1 1/4" and larger diameter per project requirements: Conduit joint couplings and connectors: steel double set screw indenter fittings, metal bushings for 1 1/4" conduit, insulated metallic bushings for 1-1/4" and larger conduit, insulated metallic bushings with grounding lugs as required.
 2. Conduit sweeps: minimum 10 times the conduit inside diameter.
 3. Include required conduit straps, and hangers, heavy-duty malleable iron or steel, perforated pipe strap, j-hooks, bridle rings, or wire hangers are not permitted.
 4. LB fittings and plastic fittings are not permitted
 5. Nipple runs from one outlet box to another outlet box are not permitted.
- B. Outlet boxes: Galvanized steel sheet metal 2" x 4" x 2-1/8" deep minimum with single gang mud ring, except for Teacher's Jack.
1. Teacher's Outlet boxes: This requires one (1) 4" x 4" gang boxes at each Teacher's Outlet location.
- C. Pull-boxes: Minimum 14 gauge galvanized steel with screw fastened cover and trim for flush or surface mounting as required for the project. Dimensions as required for the project.
- D. Metal Flex Conduit (1 1/4") and deep Cut-In Boxes where required.
- E. Pull-rope: Polypropylene monofilament line with a minimum pull tensile strength of 200 pounds.
- F. Labels for conduit and pull-boxes: 1" x 2" yellow background with 3/8" lettering to read "TELECOM"

2.2 NON-CONTINUOUS CABLE SUPPORT (J-HOOKS) SYSTEMS

- A. Construction:
1. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed.
 2. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
 3. Non-continuous cable supports sized 1 5/16" and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.
 4. Non-continuous cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.
 5. Stainless steel non-continuous cable supports are intended for indoor and outdoor use in non-corrosive environments or where only mildly corrosive conditions apply.
- B. Multi-Tiered Non-Continuous Cable Supports Assemblies:
1. Multi-tiered non-continuous cable support assemblies shall be used where separate cabling compartments are required. Assemblies may be factory assembled or assembled from pre-packaged kits.
 2. Assemblies shall consist of a steel angled hanger bracket holding up to six non-continuous cable supports, rated for indoor use in non-corrosive environments; cULus Listed.
 3. If required, the multi-tier support bracket may be assembled to manufacturer recommended specialty fasteners including beam clamps, flange clips, C and Z purlin clips.
- C. Non-Continuous Cable Support Assemblies from Beam, Flange:

1. Fastener to C to Z purlin with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.
- D. Non-Continuous Cable Support Assemblies from C & Z Purlin:
1. Fastener to C to Z purlin with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments, cULus Listed.
- E. Non-Continuous Cable Support Assemblies from Wall, Concrete, or Joist
1. Fastener to wall, concrete, or joist with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments, cULus Listed.
- F. Non-Continuous Cable Support Assemblies from Threaded Rod:
1. Fastener to threaded rod with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments, cULus Listed.
 2. The multi-tiered support bracket shall have a static load limit of 300 lbs.
- G. Installation Accessories for Non-Continuous Cable Supports
1. Non-continuous cable supports may be used as an installation tool when a removable pulley assembly is included.
 2. The pulley shall be made of plastic and be without sharp edges.
 3. The pin and bail assembly must be able to be secured to the J-Hook during cable installation.
 4. The pulley must remain secured while cables are being pulled.
 5. The pin and roller assembly must be removed after cables are installed.

2.3 WIRELESS ACCESS BOXES

- A. Wall-mounted enclosure for Wireless Access Equipment-Gymnasium
1. Vented Steel enclosure 11" x 8" x 3"
 2. Finish matching wall plates
 3. Continuous hinge swing door with keyed lock
 4. Knockouts for cable entry/exit
 5. Two 1" antenna openings 5" apart on top of enclosure
 6. Include components and compatible fittings from the manufacturer as required for a complete installation
- B. Ceiling Enclosure for Wireless Access Equipment – classrooms and hallways
1. Plenum-rated enclosure
 2. Mounts in standard 2' x 2' or 2' x 4' ceiling tile
 3. Continuous hinge swing down door with keyed lock
 4. Cable entry/exit opening with approved fire-rating foam kits
 5. Two 1" antenna openings 5" apart on bottom of enclosure
 6. Include components and compatible fittings from the manufacturer as required for a complete installation.

2.4 FLOOR BOXES

A. Acceptable Manufacturers:

1. Legrand
2. Wiremold
3. Or approved equal

B. Floor Boxes

1. Classification and Use: Floor boxes shall have been examined and tested by Underwriters Laboratories Inc. to meet UL514A and/or UL514C and Canadian Standard C22.2, No. 18.1-04 and 18.2-06 and bear the U.S. and Canadian UL Listing Mark. Floor boxes shall also have been tested by Underwriters Laboratories Inc. and classified for fire resistance and bear the U.S. and Canadian UL Classification Mark. Devices shall be classified for use in 2-hour rated, unprotected reinforced concrete floors and 2-hour rated floors employing unprotected steel floor units and concrete toppings (D900 Series Designs) or concrete floors with suspended ceilings (fire resistive designs with suspended ceilings should have provisions for accessibility in the ceiling below the floor boxes). Floor boxes shall also conform to the standards set in Section 300-21 of the National Electrical Code. Floor boxes shall meet UL scrub water requirements, but are not suitable for wet or damp locations, or other areas subject to saturation with water or other liquids such as commercial kitchens. Floor boxes shall also have been evaluated by UL to meet the applicable U.S. and Canadian safety standards for scrub water exclusion when used on tile, bare concrete, terrazzo, wood, and carpet covered floors. Floor boxes shall be suitable for use in air handling spaces in accordance with Section 300-22 (C) of the National Electrical Code.
2. Floor Boxes, General: Evolution Series Floor Boxes for use on above grade concrete floors, raised floors or wood floors. Provide boxes with a component to permit installation in polished concrete or terrazzo floors. Boxes shall be compatible with complete line of Ortronics® workstation connectivity outlets and modular inserts.
 - a. Floor boxes provide the interface between power, communication and audio/video (A/V) cabling in above-grade floors, on-grade concrete floors, raised floors, wood floors, and fire-classified floors and the workstation or activation location where power and communication and/or A/V device outlets are required. Boxes shall provide recessed device outlets that will not obstruct the floor area. Refer to Drawings for size and types.
 - b. Floor boxes shall permit all wiring to be completed at floor level. The FC models shall be used as defined by the UL Fire Resistance Directory at a minimum spacing of two (2) ft [610mm] on center.

C. The following model floor boxes shall be used according to the appropriate connector density and architectural application.

1. Model EFB6S Floor Boxes: Manufactured from stamped steel approved for use on above grade concrete floors, raised floors and wood floors with the same product. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall have a polyester based backed enamel finished interior (white). Boxes shall be 15-3/16" L x 13-7/8" W x 4-3/16" H [385mm x 351mm x 107mm]. Provide boxes with provisions that enable installation into concrete floors, raised floors, or wood floors without having to purchase additional components or accessories. Provide boxes with six (6) independent wiring compartments that allow for up to six (6) receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent compartments.

Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 32-in³ [524ml]. Each of the two (2) center compartments shall have a minimum wiring capacity of 38.5-in³ [630ml]. Each of the six (6) compartments shall have a minimum depth of 3-7/8" [98mm] behind the plate. Provide boxes with removable compartments to facilitate installation and moves, additions, and changes. The compartments shall be removable from the top and back of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with removable knockout plates to allow for the maximum cable pass-through area. The cable pass-through area shall be a minimum of 6-15/16 in² [176mm²]. The box shall contain the following number of knockouts: 10 1" trade size, six (6) 1-1/4" trade size, six (6) 3/4" trade size, and two (2) 2" trade size. Boxes shall be able to accept up to (6) six 2" trade size conduit feeds in the sides of the boxes, through the use of the EFB6S-2HUB and maintain a 4-inch deep concrete pour. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. Equip boxes with toggle clamps to allow box to be secured to raised and wood floors. The box shall be able to accept 2-3/4" x 4-1/2" standard size wall plates. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles, Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

2. Model EFB6S-OG Floor Boxes: Manufactured from stamped steel approved for use in above grade and on-grade floor applications. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall be painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and be approved for use on-grade and above grade floors. Boxes shall be 15-3/16" L x 13-7/8" W x 4-3/16" H [385mm x 351mm x 107mm]. Provide boxes with six (6) independent wiring compartments that allow for up to six (6) duplex receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 32-in³ [524ml]. Each of the two (2) center compartments shall have a minimum wiring capacity of 38.5-in³ [630ml]. Each of the six (6) compartments shall have a minimum depth of 3-7/8" [98mm] behind the plate. Provide boxes with removable compartments to facilitate installation. The compartments shall be removable from the top of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. The box shall contain the following number of knockouts: 10 1" trade size, six (6) 1-1/4" trade size, six (6) 3/4" trade size, and two (2) 2" trade size. Boxes shall be able to accept up to (6) six 2" trade size conduit feeds in the sides of the boxes, through the use of the EFB6S-2HUB and maintain a 4-inch deep concrete pour. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. The box shall be able to accept 2-3/4" x 4-1/2" standard size wall plates. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles, Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

3. Model EFB6S-FC Floor Boxes: Manufactured from stamped steel approved for use in 2-hour fire-rated concrete floors. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall have a polyester based backed enamel finished interior (white). Boxes shall be 15-3/16" L x 13-7/8" W x 4-3/16" H [385mm x 351mm x 107mm]. Provide boxes with a 21-3/4" L x 17-1/4" W x 6-1/2" H [552mm x 438mm x 165mm] sheet metal concrete pan to ensure that 3-1/4 inches [83mm] of concrete surrounds the box. Provide boxes with six (6) independent wiring compartments that allow for up to six (6) receptacles, communication and/or audio/video services. Boxes shall permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 32-in³ [524ml]. Each of the two (2) center compartments shall have a minimum wiring capacity of 38.5-in³ [630ml]. Each of the six (6) compartments shall have a minimum depth of 3-7/8" [98mm] behind the plate. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with four (4) intumescent services feed stems with a 1-1/4-inch [32mm] pass-through channel that allows the pathway to close off during a fire. Boxes shall be fully adjustable, accommodating a maximum 2-1/2-inch [64mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. The box shall be able to accept 2-3/4" x 4-1/2" standard size wall plates. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles, Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.
4. Model EFB8S Floor Boxes: Manufactured from stamped steel approved for use on above grade concrete floors, raised floors and wood floors with the same product. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall have a polyester based backed enamel finished interior (white). Boxes shall be 15-3/16" L x 12-3/4" W x 6-1/16" H. Provide boxes with provisions that enable installation into concrete floors, raised floors, or wood floors without having to purchase additional components or accessories. Provide boxes with eight (8) independent wiring compartments that allow for up to eight (8) receptacles, communication and/or audio/video services. Boxes shall accept standard size single gang (2-3/4" x 4-1/2"), double gang (4-9/16" x 4-1/2"), and triple gang (6-3/8" x 4-1/2") wall plates. Boxes shall permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 28-in³. Each of the four (4) center compartments shall have a minimum wiring capacity of 34-in³. Each of the eight (8) compartments shall have a minimum depth of 3- 1/2" [89mm] behind the plate. Provide boxes with removable compartments to facilitate installation and moves, additions, and changes. The compartments shall be removable from the top and back of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with removable knockout plates to allow for the maximum cable pass-through area. The cable pass-through area shall be a minimum of 11-5/8 in². The box shall contain the following number of knockouts: four (4) 3/4-inch trade size, eight (8) 1-inch trade size, six (6) 1-1/4-inch trade size, and two (2) 2-inch trade size. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" post-concrete pour adjustment. Equip boxes with toggle clamps to allow box to be secured to raised and wood floors. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall have the ability to accommodate a bracket (EFB-50A) allowing for one (1) 50-amp receptacle. Boxes shall also accommodate Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

5. Model EFB8S-OG Floor Boxes: Manufactured from stamped steel approved for use in above grade and on-grade floor applications. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall be painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and be approved for use on-grade and above grade floors. Boxes shall be 15-3/16" L x 12-5/8" W x 6-1/16" H [385mm x 321mm x 154mm]. Provide boxes with eight (8) independent wiring compartments that allow for up to eight (8) duplex receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 28-in3 [455ml]. Each of the four (4) center compartments shall have a minimum wiring capacity of 34-in3 [455ml]. Each of the eight (8) compartments shall have a minimum depth of 3- 1/2" [89mm] behind the plate. Provide boxes with removable compartments to facilitate installation. The compartments shall be removable from the top of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. The box shall contain the following number of knockouts: 12 1-inch trade size, six (6) 1-1/4-inch trade size, and four (4) 2-inch trade size. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. The box shall be able to accept standard size single gang (2-3/4" x 4-1/2"), double gang (2-3/4" x 4- 1/2"), and triple gang (6-3/8" x 4-1/2") wall plates. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall have the ability to accommodate a bracket (EFB-50A) allowing for one (1) 50-amp receptacle. Boxes shall also accommodate Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers and other open system devices.
6. Model EFB8S-FC Floor Boxes: Manufactured from stamped steel approved for use in 2-hour fire- rated concrete floors. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall have a polyester based backed enamel finished interior (white). Boxes shall be 15-3/16" L x 13-7/8" W x 4-3/16" H [385mm x 351mm x 107mm]. Provide boxes with a 21-3/4" L x 17-1/4" W x 6-1/2" H [552mm x 438mm x 165mm] sheet metal concrete pan to ensure that 3-1/4 inches [83mm] of concrete surrounds the box. Provide boxes with eight (8) independent wiring compartments that allow for up to eight (8) receptacles, communication and/or audio/video services. Boxes shall have removable and repositionable dividers to permit feed to adjacent compartments and reconfiguration of devices. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the compartments shall have a minimum wiring capacity of 53-in3 [860ml]. Each of the eight (8) compartments shall have a minimum depth of 3-1/2" [89mm] behind the plate. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with removable compartments to facilitate installation. Provide boxes with four (4) intumescent services feed stems with a 1-1/4-inch [32mm] pass- through channel that allows the pathway to close off during a fire. Boxes shall be fully adjustable, accommodating a maximum 2-1/2-inch [64mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. The box shall be able to accept standard size single gang (2-3/4" x 4-1/2"), double gang (4-9/16" x 4-1/2"), and triple gang (6-3/8" x 4-1/2") wall plates. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall have the ability to accommodate a bracket (EFB-50A) allowing for one (1) 50-amp receptacle. Boxes shall also accommodate Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

7. Model EFB10S Floor Boxes: Manufactured from stamped steel approved for use on above grade concrete floors, raised floors and wood floors with the same product. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall have a polyester based backed enamel finished interior (white). Boxes shall be 15-3/16" L x 12-3/4" W x 6-1/16" H [385mm x 324mm x 154mm]. Provide boxes with provisions that enable installation into concrete floors, raised floors, or wood floors without having to purchase additional components or accessories. Provide boxes with 10 independent wiring compartments that allow for up to 10 receptacles, communication and/or audio/video services. Boxes shall permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Six (6) of the 10 compartments shall have a minimum wiring capacity of 23-1/2-in³ [597ml]. Four (4) of the 10 compartments shall have a minimum wiring capacity of 27-in³ [686ml]. Each of the 10 compartments shall have a minimum depth of 3-1/2" [89mm] behind the plate. Provide boxes with removable compartments to facilitate installation and moves, additions, and changes. The compartments shall be removable from the top and back of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with removable knockout plates to allow for the maximum cable pass-through area. The cable pass-through area shall be a minimum of 11-5/8 in² [7500mm²]. The box shall contain the following number of knockouts: four (4) 3/4-inch trade size, 10 1-inch trade size, eight (8) 1-1/4-inch trade size, and two (2) 2-inch trade size. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. Equip boxes with toggle clamps to allow box to be secured to raised and wood floors. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall have the ability to accommodate a bracket (EFB-50A) allowing for one (1) 50-amp receptacle. Boxes shall also accommodate Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.
8. Model EFB10S-OG Floor Boxes: Manufactured from stamped steel approved for use in above grade and on-grade floor applications. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall be painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and be approved for use on-grade and above grade floors. Boxes shall be 15-3/16" L x 12-5/8" W x 6-1/16" H [385mm x 321mm x 154mm]. Provide boxes with 10 independent wiring compartments that allow for up to 10 duplex receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Six (6) of the 10 compartments shall have a minimum wiring capacity of 23-1/2-in³ [597ml]. Four (4) of the 10 compartments shall have a minimum wiring capacity of 27-in³ [686ml]. Each of the 10 compartments shall have a minimum depth of 3-1/2" [89mm] behind the plate. Provide boxes with removable compartments to facilitate installation. The compartments shall be removable from the top of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. The box shall contain the following number of knockouts: 14 1-inch trade size, six (6) 1-1/4-inch trade size, and four (4) 2-inch trade size. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall have the ability to accommodate a bracket (EFB-50A) allowing for one (1) 50-amp receptacle. Boxes shall also accommodate Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

9. Model EFB10FC Floor Boxes: Manufactured from stamped steel approved for use in 2-hour fire-rated concrete floors. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall have a polyester based backed enamel finished interior (white). Boxes shall be 15-3/16" L x 13-7/8" W x 4-3/16" H [385mm x 351mm x 107mm]. Provide boxes with a 21-3/4" L x 17-1/4" W x 6-1/2" H [552mm x 438mm x 165mm] sheet metal concrete pan to ensure that 3-1/4 inches [83mm] of concrete surrounds the box. Provide boxes with 10 independent wiring compartments that allow for up to 10 receptacles, communication and/or audio/video services. Boxes shall have removable and repositionable dividers to permit feed to adjacent compartments and reconfiguration of devices. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the compartments shall have a minimum wiring capacity of 53-in³ [860ml]. Each of the 10 compartments shall have a minimum depth of 3-1/2" [89mm] behind the plate. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with removable compartments to facilitate installation. The compartments shall be removable from the top of the floor box. Provide boxes with four (4) intumescent services feed stems with a 1-1/4-inch [32mm] pass-through channel that allows the pathway to close off during a fire. Boxes shall be fully adjustable, accommodating a maximum 2-1/2-inch [64mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall have the ability to accommodate a bracket (EFB-50A) allowing for one (1) 50-amp receptacle. Boxes shall also accommodate Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.
10. Model EFBFF Floor Boxes: Manufactured from stamped steel approved for use on above grade concrete floors, raised floors and wood floors with the same product. Boxes shall have the ability to accept a component (FP-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall be 7-1/16" L x 6-5/8" W x 4-1/8" H [179mm x 168mm x 105mm]. Provide boxes with provisions that enable installation into concrete floors, raised floors, or wood floors without having to purchase additional components or accessories. Provide boxes with two (2) independent wiring compartments that allow for power, communication and/or audio/video services. Each of the two (2) wiring compartments shall have a minimum wiring capacity of 64- 1/2-in³ [1056ml]. The box shall be equipped with a metal divider to separate the services and maintain code requirements. The box shall contain the following number of knockouts: four (4) 1/2-inch trade size, four (4) 3/4"-inch trade size, one (1) 1-inch trade size, six (6) 1-1/4-inch trade size, one (1) 1-1/2-inch trade size, and two (2) 2-inch. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. Equip boxes with toggle clamps to allow box to be secured to raised and wood floors.
11. Model EFBFF-OG Floor Boxes: Manufactured from stamped steel approved for use in above grade and on-grade floor applications. Boxes shall have the ability to accept a component (FP- CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall be painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and be approved for use on-grade and above grade floors. Boxes shall be 7-1/16" L x 6-5/8" W x 4-1/8" H [179mm x 168mm x 105mm]. Provide boxes with provisions that enable installation into concrete floors, raised floors, or wood floors without having to purchase additional components or accessories. Provide boxes with two (2) independent wiring compartments that allow for power, communication and/or audio/video services. Each of the two (2) wiring compartments shall have a minimum wiring capacity of 64- 1/2-in³ [1056ml]. The box shall be equipped with a metal divider to separate the services and maintain code requirements.

The box shall contain the following number of knockouts: four (4) 1/2-inch trade size, four (4) 3/4-inch trade size, one (1) 1-inch trade size, six (6) 1-1/4-inch trade size, one (1) 1-1/2-inch trade size, and two (2) 2-inch. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment.

D. Activation Covers: The following model covers shall be used according to the appropriate application.

1. Evolution EFB610BT and EFB610CT Series Covers: Manufactured of die-cast aluminum. Activation covers shall be available in surface mount and flush versions. Provide covers with two (2) gaskets (one (1) for carpet and one (1) for tile) to go under the trim flange to maintain scrub watertightness. Covers shall be 16-15/16" x 12-1/2" x 3/16" [430mm x 318mm x 4mm]. Covers shall be available with a carpet recess area or a solid lid. Secure the cover to the flange and enable cover to rotate greater than 180 degrees to reduce trip hazards and provide maximum amount of working space. Provide covers with spring-loaded self-closing slide egress doors to reduce egress opening when cables are exiting and reduce trip hazards. Each of the two (2) egress openings shall have a minimum of 4-in² [102mm²], or a minimum of 8-in² [203mm²] per cover assembly. Cover finish shall be as follows:
2. FloorPort FPFFTC Series Covers: Manufactured of die-cast aluminum or die-cast zinc, and available in brushed aluminum finish and powder-coated paint finishes (black, gray, bronze, nickel and brass). Activation covers shall be available in flanged version. Covers shall come equipped with one (1) 1-inch trade size screw plug opening and one (1) combination 1-1/4-inch and 2-inch trade size screw plug.
 - a. Flanged covers shall be 7-3/4" L x 6-9/16" W [197mm x 167mm].

2.5 FIRE STOPPING

A. Fire Stopping materials used for this project shall comply with the following:

1. Products shall allow for normal expansion and contraction movement of the penetrating item without failure of the penetration seal.
2. Products shall emit no hazardous, combustible, or irritating by-products during installation or curing period.
3. Products shall not require special tools for installation.
4. Products shall provide penetration seal assemblies whose fire-resistance ratings have been determined by testing in the configurations required and which have fire-resistance ratings at least as high as that of the fire-rated assembly in which they are to be installed.
5. All fire stopping shall be manufactured by the following:
 - a. Bio Fireshield, Inc.
 - b. Dow Corning Corp.
 - c. GE Silicones, Hilti, Inc.
 - d. 3M Ceramic Materials.
 - e. Or approved equal

PART 3 - EXECUTION

3.1 PATHWAYS

A. Pathways shall be designed and installed to meet applicable local and national building and electrical codes or regulations and shall have no exposed sharp edges that may come into contact with data or telecommunications cables.

- B. All wall penetrations shall be installed with sleeves that shall have no exposed sharp edges that may come into contact with data or telecommunications cables.
- C. Pathways shall not be located in elevator shafts unless specifically approved by the Design Consultant in writing.

3.2 CABLE PATHWAYS

- A. Horizontal pathways shall be installed or selected such that the minimum bend radius of horizontal cables is kept within manufacturer specifications both during and after installation.
- B. Cable pathways, which run parallel with electric power or lighting that is less than or approved equal to 480 Vrms, shall be installed with a minimum clearance of 6 in.
- C. In the MDF/IDF(s) where cable trays or cable racking are used, the appropriate means of cable management such as reusable color-coded hook and loop cable managers (ties) shall be used to create a neat appearance and practical installation.
- D. Continuous conduit runs installed by the contractor should not exceed 100 feet or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes.
- E. All horizontal pathways shall be designed, installed and grounded to meet applicable local and national building and electrical codes.

3.3 FIRE PROTECTION

- A. All wall penetrations shall require properly installed firestop systems code compliant that shall be installed to prevent or retard the spread of fire, smoke, water, and gases through the building.
- B. Sheathing installed for wall penetrations must also be firestopped.
- C. Fire stops shall be done to applicable code using approved materials.

END OF SECTION 270528

SECTION 271000 – STRUCTURED CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Wire, cable, and connecting devices for wiring systems to be used as signal pathway or voice, and high-speed data transmission.
- B. System Diagram: Refer to T-Drawings

PART 2 - PRODUCT

2.1 MATERIALS

- A. Available Manufacturers
 - 1. Belden CDT Inc.; Electronics Division.
 - 2. Berk-Tek; a Nexans company.
 - 3. CommScope, Inc.
 - 4. Or approved equal.

2.2 TWISTED – PAIR CABLES, CONNECTORS AND TERMINAL EQUIPMENT

- A. Voice Backbone, 100 Pair Category 6 UTP cable.
- B. Conductors: Solid copper conductors
- C. Cross-connect panel rack mounted
- D. Patch panel, rack mounted
- E. Horizontal UTP, 4-pair Category 6
- F. Workstation Outlets: Category 6 jack-connector assemblies.

2.3 FIBER-OPTIC CABLES, CONNECTORS, AND TERMINAL EQUIPMENT:

- A. Cables: Factory fabricated, jacketed, glass type, multimode, graded index.
- B. Backbone, Strands per cable: 12 (6 pair)
- C. Patch panel Rack mounted

2.4 COAXIAL CABLES, CONNECTORS AND TERMINAL EQUIPMENT

- A. Video Backbone: RG11 with double braid and tape shield.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION OF MEDIA

- A. Backbone Cable for Data Service: Use multi-mode fiber-optic cable for runs between equipment rooms and wiring closets and for runs between wiring closets.
- B. Backbone Cable for Voice Service: Use UTP Category 3, 100 pair, for runs between equipment rooms and wiring closets and for runs between wiring closets.
- C. Horizontal Cable for Data Service: Use UTP Category 6 cable for runs between wiring closets (MDF/IDFs) and workstation outlets.
- D. Horizontal Cable for Voice Service: Use UTP Category 6 cable for runs between wiring closets (MDF/IDFs) and workstation outlets.

3.3 INSTALLATION

- A. Wiring Method: Install wiring and optical fiber in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.
- B. Install cables using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.
- C. Install cables without damaging conductors, shield, or jacket.
- D. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer.
- E. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
 - 1. Pull cables simultaneously if more than one is being installed in same raceway.
 - 2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
 - 3. Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips that will not damage media or raceway.
- F. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.
- G. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

- H. Wiring within Wiring Closets and Enclosures: Provide conductors of adequate length. Train conductors to terminal points with no excess. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radius than minimums recommended by manufacturer.
- I. Separation of Wires: Comply with TIA/EIA-569-A rules for separating unshielded copper voice and data communication cabling from potential EMI sources, including electrical power lines and equipment.
- J. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.
- K. Use splice and tap connectors compatible with media types.

3.4 GROUNDING

- A. Ground cable shields, run conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- B. Signal Ground Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
- C. Signal Ground Bus: Mount on wall of main equipment room with standoff insulators.
- D. Signal Ground Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.5 INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS

- A. Install plywood backboards (furnished by others) on walls of equipment rooms and wiring closets.
- B. Mount patch panels, terminal strips, and other connecting hardware on backboards, unless otherwise indicated.
- C. Group connecting hardware for cables into separate logical fields.
- D. Use patch panels to terminate cables entering the space, unless otherwise indicated.

3.6 INSTALLATION STANDARDS

- A. Comply with requirements in TIA/EIA-568-A and TIA/EIA-569-A.

3.7 IDENTIFICATION

- A. In addition to requirements in this Article, comply with applicable requirements in TIA/EIA-606.
- B. Workstation: Label cables within outlet boxes.
- C. Distribution Racks and Frames: Label each unit and field within that unit.

- D. Within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- E. Cables, General: Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
- F. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m)
- G. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project, in software and format selected by the District.
- H. Cable Administration Drawings: Show building floor plans with cable administration point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606. Furnish electronic record of all drawings, in software and format selected by the Authority.

3.8 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.
 - 2. Copper Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bi-directional, Category 6 tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA-TSB 67, "Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems." Link performance for UTP cables must meet minimum criteria of TIA/EIA-568-A.
 - 3. Fiber-Optic Cable Procedures: Perform each visual and mechanical inspection and electrical test, including optional procedures, stated in NETA ATS, Section 7.25. Certify compliance with test parameters and manufacturer's written recommendations. Test optical performance with optical power meter capable of generating light at all appropriate wavelengths.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

3.9 TESTING, IDENTIFICATION AND ADMINISTRATION

- A. Copper Cable
 - 1. All Category 6 UTP cable shall be tested to a frequency of 350MHz to demonstrate compliance with the individual manufacturers advertised electrical characteristics.

2. All Category 6 UTP cable shall be field-tested with connectivity products installed to a frequency of 250MHz to demonstrate performance equal to or better than the minimum requirements as specified in ANSI/TIA/EIA-568b.2.1 and as listed in Table 1.
3. The Test Model shall be Permanent Link

TABLE 1 - Category 6 Permanent Link Limits in dB per ANSI/TIA/EIA-568B.2-1

Parameter	Performance @ 100MHz	Performance @ 200MHz	Performance @ 250MHz	Performance @ 300MHz
Insertion Loss	19.0 dB	27.4 dB	30.9 dB	34.1 dB
NEXT Loss	43.9 dB	39.3 dB	37.8 dB	36.6 dB
PS NEXT Loss	41.9 dB	37.3 dB	35.8 dB	34.6 dB
ACR	24.9 dB	11.9 dB	6.9 dB	2.5 dB
PS ACR	22.9 dB	9.9 dB	4.9 dB	0.5 dB
ELFEXT	26.3 dB	20.3 dB	18.3 dB	16.8 dB
PS ELFEXT	23.4 dB	17.3 dB	15.4 dB	13.8 dB
Return Loss	14.7 dB	11.7 dB	10.7 dB	9.9 dB
Propagation Delay	528 ns	527 ns	526 ns	526 ns
Delay Skew	40 ns	40 ns	40 ns	40 ns

4. All testing shall be performed with a UTP/ScTP field test device that has been factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided for review prior to the start of testing.
5. Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters.
6. Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.
7. UTP horizontal and backbone cables shall be 100 percent tested according to ANSI/TIA/EIA-TSB-67 and ANSI/TIA/EIA-568-B.2.1. Test parameters include wire map plus shield continuity (when present), length, NEXT loss (pair-to-pair), NEXT loss (power sum), ELFEXT loss (pair-to-pair), ELFEXT loss (power sum), return Loss, attenuation, propagation delay, and delay skew.

B. Fiber Optic Cable

1. Backbone
 - a. Fiber backbone cables shall be 100% tested for attenuation and length.
 - b. Attenuation shall be tested at 850 nm and 1300 nm for 50/125 nm multimode in at least one direction using the 2-jumper method.
 - c. Acceptable attenuation test results shall be determined using the following calculation:
 - 1) Link attenuation = cable attenuation + connector attenuation + splice attenuation.
 - 2) Cable attenuation, connector attenuation and splice attenuation are determined by each of the following formulas:
 - a) Cable Attenuation:
 Cable attn. (dB) = Attn. coefficient (dB/km) x length (km)
 Attenuation Coefficient = 3.0 dB/km @ 850 nm

- b) Connector Attenuation:
Connector attn. (dB) = number of connector pairs x connector loss = 2 x 0.65 dB = 1.3 dB
 - c) Splice Attenuation:
Splice attn. (dB) = number of splices (s) x splice loss (dB) = s x 0.3 dB
 - d. The Backbone Channel performance guarantees are as follows:
 - 1) Max Attenuation 850/1300 nm: 3.0/1.0 dB 2) Bandwidth 850/1300 nm: 1500/500 MHz/km
 - 3) ☐ Min. Return Loss: 20dB
 - 4) For each additional mated pair of connectors, add the following to the attenuation values as noted in above chart:
 - a) add 0.75 dB @ 850nm
 - b) add 0.65 dB @ 1300nm
 - 5) For each splice, add 0.30 dB to the attenuation values as noted in above chart (applicable to both M/M and S/M).

3.10 CUTOVER

- A. The contractor shall place cross connects at Telecommunication Equipment Rooms.

3.11 Training

- A. District training shall include:
 - 1. Physical review of installed cable plant.
 - 2. Review of cable plant documentation and test results.
 - 3. Instructions on industry standard termination and testing methods to enable customer personnel to successfully terminate and test cabling.

3.12 DEMONSTRATION

- A. Train the District's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and extending wiring to establish new workstation outlets.

END OF SECTION 271000

SECTION 271300 – COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pathways.
2. UTP cable.
3. Fiber Optic cable.
4. Cable connecting hardware, patch panels, and cross-connects.
5. Cabling identification products.

1.2 BACKBONE CABLING DESCRIPTION

- A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.
- B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by the District.
2. Cabling administration drawings and printouts.
3. Wiring diagrams to show typical wiring schematics including the following:
 - a. Cross-connects.
 - b. Patch panels.
 - c. Patch cords.
4. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
5. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements.

C. Warranty: Provide manufacturer's system warranty against electrical or mechanical defects for 2 years from date of final acceptance.

D. Source quality-control reports.

E. Field quality-control reports.

- F. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Layout Responsibility: Preparation of Shop Drawings and Cabling detail /administration Drawings by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician or Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

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. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

E. Grounding: Comply with ANSI-J-STD-607-A and NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site. Test each pair of UTP cable for open and short circuits.

B. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
2. Neatly support cabling and brackets; utilize cable tie slots for fastening cable ties to brackets, lacing bars, spools, J-hooks, and D-rings, Straps and other devices.

B. Cable Trays:

1. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cablofil Inc.
 - b. Cooper B-Line, Inc.
 - c. Cope - Tyco/Allied Tube & Conduit.
 - d. Or approved equal.
2. Cable Tray Material: Metal, suitable for indoors, and protected against corrosion by complying with ASTM B 633, refer to Division 27.

2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, ¾ by 48 by 96 inches (19 by 1220 by 2440 mm). Comply with requirements in Division 6 for plywood backing panels.

2.3 OPTICAL FIBER CABLE

- A. Available 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. Berk-Teck; a Nexans Company
 2. CommScope, Inc.
 3. Corning Cable Systems
 4. General Cable Technologies Corporation.
 5. Mohawk; a division of Belden CDT.
 6. Nordex/CDT; a subsidiary of Cable Design Technologies.
 7. Optical Connectivity Solutions Division; Emerson Network Power.
 8. Superior Essex Inc.
 9. SYSTIMAX Solutions; a CommScope Inc. brand.
 10. 3M.
 11. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
 12. Or approved equal.
- B. Description: Multimode 62.5/125 micrometer optical fiber cable.
 1. Comply with ICEA S-3-596 for mechanical properties.
 2. Comply with TIA/EIA-568-B.3 for performance specifications.
 3. Comply with TIA/EIA-492AAAA-B for detailed specifications.
 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 - a. General Purpose, Nonconductive: Type OFNR, OFNP.
 - b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
- C. A 12 strand multi-mode fiber optic backbone and a 12 strand single-mode fiber optic backbone shall be employed between the MDF and each Telecommunications Closet for data connectivity. Provide riser and backbone cables as indicated on riser diagrams. All fibers within IDF's shall terminate in SC Type fiber patch shelves mounted in equipment racks. All fibers within shall terminate in ST Type fiber patch shelves mounted in equipment racks.

2.4 GROUNDING

- A. Comply with requirements in Division 16 for Electrical Systems." for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.

2.5 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

- A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for raceways and boxes specified in Division 16.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27. Drawings indicate general arrangement of pathways and fittings.
- C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- D. Comply with requirements in Division 16 for installation of conduits and wireways.

- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- F. Pathway Installation in Communications Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 - 2. Install cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard when entering room from overhead.
 - 4. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-B.1.
 - 2. Comply with BICSI ITSIM, Ch. 6 "Cable Termination Practices."
 - 3. Install 110-style IDC termination hardware unless otherwise indicated.
 - 4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
 - 8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - 9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 - 10. In the communications equipment room, install a 10-footlong service loop on each end of cable.
 - 11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- C. UTP Cable Installation:
 - 1. Comply with TIA/EIA-568-B.2.
- D. Open-Cable Installation:
 - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 - 2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.

3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- E. Group connecting hardware for cables into separate logical fields.
- F. Separation from EMI Sources:
 1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
 6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.5 FIRESTOPPING

- A. Comply with requirements in Division 7. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26.

1. Administration Class: 2
 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Comply with requirements in Division 9 for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- C. See Evaluations for discussion about TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration including optional identification requirements specified on drawings and/or in of this standard.
- D. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- F. Cable and Wire Identification:
1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:
1. Cables use flexible vinyl or polyester that flexes as cables are bent.
- 3.8 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test

Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

- B. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- C. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- D. Prepare test and inspection reports.

END OF SECTION 271300

SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING

PART 1 – GENERAL

1.1 SCOPE OF SPECIFICATION

- A. This section includes the minimum requirements for the following:

1. Horizontal Cabling

1.2 FUNCTIONAL SYSTEM DESCRIPTION

- A. The Voice / Data Horizontal Cabling will originate from the Main Distribution Frame (MDF) located on the first floor of the building. LAN cabling runs that exceed the 290 foot distance limitation from the MDF shall be serviced an Intermediate Distribution Frame (IDF) to form distribution sub-systems.

PART 2 - PRODUCTS

2.1 HORIZONTAL CABLING

- A. The horizontal cabling subsystem is the portion of the cabling system that extends from the work area outlet/connector (wall jack) to the horizontal cross-connect in the Main or Intermediate Distribution Frame Room (MDF or IDF). It consists of the outlet/connector, the horizontal cables, consolidation point (if required), and that portion of the cross-connect in the MDF/IDF serving the horizontal cable. Unless otherwise indicated, each floor of the building is served by its own horizontal cabling subsystem.
- B. All UTP and fiber optic cables shall conform to ANSI/TIA/EIA-568-A Commercial Building Telecommunications Cabling Standard (latest amendment and including all applicable addenda) and ISO/IEC 11801 (International) Generic Cabling for Customer Premises standard (latest amendment and including all applicable addenda).
1. UTP Category 6 cable shall comply with the following specification:
 - a. Pairs: 4
 - b. Insulation: Teflon or approved equal
 - c. Color:
 - 1) Voice/Data – Blue
 - 2) Wireless Data – Purple
 - 3) Security – Green
 - d. Type: 24 AWG Twisted
 - e. Impedance: 100 ohms \pm 15% across the band
 - f. Attenuation/100m:
 - 1) 6.5 db @ 10 MHz
 - 2) 9.3 db @ 20 MHz
 - 3) 21.7 db @ 100 MHz
 - 4) 32.0 db @ 200 MHz
 - 5) 44.3 db @ 350 MHz
 - g. Capacitance: 4.4 nF/100m @ 100 MHz
 - h. DC Resistance: 9.38 Ohms/100m @ 100 MHz

- i. PS-NEXT:
 - 1) 47.0 db @ 10 MHz
 - 2) 43.0 db @ 20 MHz
 - 3) 32.0 db @ 100 MHz
 - 4) 28.0 db @ 200 MHz
 - 5) 25.0 db @ 350MHz
- j. SRL:
 - 1) 16.0 db @ 350MHz(Typical)
 - 2) 19.0 db @ 100MHz (minimum)
- k. ACR, NEXT Attenuation, SRL have to be specified and tested to 350MHz.
- l. Minimum ACR rating must show 8 dB improvement over TIA/EIA 568-A Standard.
- m. Minimum SRL rating must show 3 dB improvement Over TIA/EIA 568-A Standard.
- n. Must be PS-NEXT performance ETL verified to TIA/EIA 568-A and ISO/IEC 11801.
- o. Acceptable Manufacturers or Approved Equal unless otherwise approved by the Design Consultant all horizontal cabling shall be manufactured by the following:
 - 1) Belden CDT Inc.; Electronics Division.
 - 2) Berk-Tek; a Nexans company.
 - 3) CommScope, Inc.
 - 4) Or approved equal.

PART 3 - EXECUTION

3.1 EXECUTION OF WORK

A. Cable Termination

- 1. All UTP/ScTP cables wired to outlet/connector shall have all pairs terminated.
- 2. The cable outlet/connector shall be securely mounted at planned locations.
- 3. All data faceplates shall be configured to house six (6) jack positions.
- 4. The Contractor shall provide six (6) foot long, terminated, jumper cables for use between the Patch Panels and the Switches.
 - a. Jumper cables shall have the same jacket color as the system they support.
 - b. The Contractor shall provide seven (7) and ten (10) foot long connection cables for connection of the District's PC's to their appropriate jack plates. The number of each shall be divided equally between the total number of drops.

B. Pulling Tension

- 1. The maximum cable pulling tensions shall not exceed manufacturer's specifications.
- 2. The use of winches to pull cable is NOT permitted.

C. Bend Radius

- 1. The maximum cable bend radii shall not exceed manufacturer's specifications. At a minimum the bend radius on 4-pair UTP/ScTP cable shall not exceed eight times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.

2. At cable terminations, the maximum bend radius for 4-pair UTP/ScTP cable shall not exceed four times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.

D. Slack

1. In the work area, UTP cables shall installed with a minimum of twelve (12) inches of slack.
2. In the work area, Fiber Optic cables shall be installed with a minimum of three (3) feet of slack.
3. In the MDF/IDF room(s) a minimum of ten (10) feet of slack should be left for all cable types. This slack must be neatly coiled or otherwise managed on trays or other support types.

E. Cable Tie Wraps

1. Tie wraps shall be used at appropriate intervals to secure cable and to provide strain relief at termination points. These wraps shall not be over tightened to the point of deforming or crimping the cable sheath.
2. Hook and loop cable managers should be used in the closet where reconfiguration of cables and terminations may be frequent.

END OF SECTION 271500

SECTION 276600 – COMMUNICATIONS EQUIPMENT ROOMS AND FITTINGS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.
- B. Telecommunications Rooms (MDF/IDF) are generally considered to be floor serving facilities. Horizontal Cross-connects link the Horizontal cable and the Backbone Cable together. The Horizontal Cross-connects shall consist of rack or wall mounted wiring blocks or panels for termination of copper cables or rack or wall mount interconnect termination units or fiber management panels/trays for the termination of optical fibers. Cross-connect spaces include the labeling of hardware for providing circuit identification and patch cords or cross-connect wire used for creating circuit connections at the cross-connect.

1.2 SCOPE

- A. This section includes the minimum requirements for equipment, termination hardware and cable installations in communication equipment rooms.
- B. The telecommunications room shall be equipped to contain telecommunications equipment, cable terminations, and associated cross-connects.
- C. Minimum composition requirements and installation methods for the following:
 - 1. Floor Mounted Relay Racks
 - 2. Wall Mounted Relay Racks and Brackets
 - 3. Floor Mounted Cabinets
 - 4. Cable Management Hardware
 - 5. Cable Ladder Rack (Provided by Electrical Contractor)
 - 6. Patch Panels - Category 6 - Voice
 - 7. Patch Panels - Category 6 - Data
 - 8. Fiber optic panels - Wall Mount Box
 - 9. Fiber optic panels - rack mount (low fiber count)
 - 10. Fiber optic panels/frames- rack mount (moderate fiber count)
 - 11. Fiber optic frames - rack mount (high fiber count)
 - 12. Fiber optic trays - rack mount
 - 13. Back Boards
 - 14. 66 System Blocks
 - 15. Cross Connect Wire
 - 16. Power Strips
 - 17. Optical Fiber Patch Cords
 - 18. Patch Cords - UTP Category 6 - Voice
 - 19. Patch Cords - UTP Category 6 - Data
 - 20. 66 System Patch Cords - Category 6 – Voice
 - 22. Uninterruptable Power Supplies (UPS)

1.3 QUALITY ASSURANCE

- A. All equipment rooms shall be installed in a neat and workmanlike manner.

- B. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Authority's representative.
- C. Equipment and materials shall be of the quality and Manufacturer indicated.
- D. The equipment specified is based on the acceptable manufacturers listed.
- E. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified, and subject to approval.
- F. Separation from sources of EMI shall be as specified in section.
- G. Communication grounding/earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC 1000-5-2, ANSI/TIA/EIA-607, or both be observed throughout the entire cabling system.
- H. Materials and work specified herein shall comply with the applicable requirements of:
 - 1. EIA/TIA-568-A.
 - 2. EIA/TIA-569-A
 - 3. EIA/TIA-606
 - 4. EIA/TIA-607
 - 5. Underwriters Laboratory
 - 6. Federal Communications Commission (including CFR 47 and Part 68 - subpart F)
 - 7. National Electric Code
 - 8. Local and State Codes
 - 9. ISO/IEC 11801
 - 10. IEC 1000-5-2
 - 11. CSA C22.2
 - 12. IEC 60603-7
- I. Manufacturers shall be ISO 9001 Certified, for all components that are required to have submittals provided as part of this section.

PART 2 – PRODUCTS

2.1 FLOOR MOUNTED RELAY RACKS

- A. Racks shall meet the following physical specifications:
 - 1. 19" rack mounting space.
 - 2. 7 foot high.
 - 3. Lightweight, high strength aluminum construction.
 - 4. Black powder coat finish.
 - 5. 15" deep base with four (4) ¾" bolt down holes.
 - 6. EIA Channel width of 3.0", with #12-24 screw holes
- B. Rack shall have double sided 12/24 tapped holes and EIA universal rack 5/8" to 5/8"- 1/2" standard hole pattern (compatible with 1 1/4" – 1/2" hole patterns)

2.2 WALL MOUNTED RELAY RACKS

- A. Wall Mounted Relay Racks shall be provided in locations designated on the drawings and shall meet the following physical specifications:
 - 1. 19" EIA rack mounting space.
 - 2. 48" high with 24 mounting spaces.
 - 3. Lightweight, high strength steel construction.
 - 4. Black powder coat finish.
 - 5. Stationary mounting with 21" deep, 14 gauge mounting brackets and 100 lb. capacity.
 - 6. Racks shall have double sides EIA universal rack 5/8" to 5/8" - 1/2" standard hole pattern (compatible with 1 1/4" - 1/2" hole patterns)

2.3 FLOOR MOUNTED CABINET

- A. Floor mounted cabinets shall meet the following specifications:
 - 1. 16 gauge steel construction
 - 2. Nominal 77"x21"x36"
 - 3. Vented roof
 - 4. Removable side panels.
 - 5. Leveling feet

2.4 CABLE MANAGEMENT FOR RELAY RACKS

- A. Cable management shall be black metal with integral wire retaining fingers.
- B. Vertical cable management panels shall have front and rear channels.
- C. Vertical cable management panels shall have removable front and back covers, made of black metal.
- D. A horizontal crossover cable manager shall be provided at the top of each relay rack, with a minimum height of 2 rack units each.
- E. A horizontal crossover cable manager shall be provided near the center and at the bottom of each relay rack, with a minimum height of 4 rack units.

2.5 LADDER RACK

- A. Provide ladder rack in Telecommunications Room (MDF/IDF) as shown on drawings for horizontal cable support).

2.6 PATCH PANELS - CATEGORY 6 – VOICE

- A. The termination panels shall support the appropriate Category 6 applications and facilitate cross-connection and inter-connection using modular patch cords.
- B. Shall be sized to fit an EIA standard, 19-inch relay rack, or be capable of mounting to a wall.
- C. Accommodate at least 24 ports for each rack mount space (1rms = 44.5 mm [1.75 in.]).
- D. Have circuit boards tested in both directions as required by ANSI/TIA/EIA-568-A and ISO/IEC 11801.

- E. Have patented angle left/angle right modules to provide optimum cable management.
- F. Have removable six port modules to allow replacement in the field.
- G. Have Category 6 jacks available in both T568A and T568B wiring schemes, with 66-style termination.
- H. Allow for a minimum of 200 re-terminations without signal degradation below standards compliance limit.
- I. Have modular ports compliant with FCC CFR 47 part 68 subpart F and IEC 60603-7 with 50 micro inches of gold plating over nickel contacts or equivalent.
- J. Allow the use of a 4 or 5-pair 66-style impact termination tool.
- K. Be fully enclosed front and provide rear plastic strips for physical for physical protection of printed circuit board.
- L. Have port identification numbers on both the front and rear of the panel.
- M. Provide clear label holders and white designation labels with the panel, with optional color labels available.
- N. Be made by an ISO 9001 Certified Manufacturer.
- O. ANSI/TIA/EIA-568-A and ISO/IEC 11801 proposed Category 6 compliant.
- P. The following requirements shall also be met (NEXT Loss and FEXT tested in both Differential and Common Mode):

Parameters	Performance @ 100 MHz
NEXT Loss	43.0 dB
FEXT	35.1 dB
Insertion Loss (Attenuation)	.4 dB
Return Loss	20 dB

- Q. Be UL VERIFIED for TIA/EIA Category 6 electrical performance.
- R. Shall be UL Verified for Category 6 compliance and be CSA C22.2 approved.
- S. Be made of a steel frame with black power coat finish 24, 48, and 96 port configurations.
- T. Have mounting slots compatible with ANSI/EIA-310.
- U. Allows the modular insert to accept 66-style patch plugs as a means of termination.
- V. Shall be T-568A Wired.
- W. Provide 48 port panels, unless otherwise noted.
- X. Density must accommodate at least 24 port per single rack unit (1.75" or 44.5mm)
- Y. Paired punch down sequence to allow pair twist within ½" of the termination.

- Z. Shall have port identification numbers on front and rear of the panel.
- AA. Support applications up to 250 MHz
- BB. Have 66 style insulation displacement contacts and termination accomplished with a single conductor impact tool or 4 or 5 pair impact tool.
- CC. Be backwards compatible to allow lower performing categories of cables or connecting hardware to operate to their full capacity.
- DD. Have circuit identification and color-coding designation strips provided with the panel.
- EE. Provide port configurations and densities as called for on drawings.
- FF. Provide rear cable management bar(s) as recommended by the manufacturer.
- GG. Shall be Insulation Displacement Connector 66 style terminations
- HH. Provide EIA/TIA 606 compliant color-coded icons or color-coded designation label strips for all patch panels. Identify voice or data functionality as required
- II. Paired punch down sequence to allow pair twist within ½" of the termination.
- JJ. Provide rear stress relief components as recommended by the manufacturer.
- KK. Acceptable Manufacturers
 - 1. Siemon
 - 2. Hubbell
 - 3. Panduit
 - 4. Or approved equal

2.7 PATCH PANELS - CATEGORY 6 – DATA

- A. The termination panels shall support the appropriate Category 6 applications and facilitate cross-connection and inter-connection using modular patch cords.
- B. Shall be sized to fit an EIA standard, 19-inch relay rack, or be capable of mounting to a wall.
- C. Be made of a steel frame with black power coat finish, in 24, 48, 72 and 96-port configurations.
- D. Accommodate at least 24 ports for each rack mount space (1rms = 44.5 mm [1.75 in.]).
- E. Have circuit boards tested in both directions as required by ANSI/TIA/EIA-568-A and ISO/IEC 11801.
- F. Have patented angle left/angle right modules to provide optimum cable management.
- G. Have removable six port modules to allow replacement in the field.
- H. Support applications up to 250 MHz
- I. Have Category 6 jacks available in both T568A and T568B wiring schemes, with 66-style termination.

- J. Have 66 style insulation displacement contacts and termination accomplished with a single conductor impact tool or 4 or 5 pair impact tool.
- K. Be backwards compatible to allow lower performing categories of cables or connecting hardware to operate to their full capacity.
- L. Allow for a minimum of 200 re-terminations without signal degradation below standards compliance limit.
- M. Have modular ports compliant with FCC CFR 47 part 68 subpart F and IEC 60603-7 with 50 microinches of gold plating over nickel contacts or equivalent.
- N. Allow the use of a 4 or 5-pair 66-style impact termination tool.
- O. Be fully enclosed front and provide rear plastic strips for physical protection of printed circuit board.
- P. Have port identification numbers on both the front and rear of the panel.
- Q. Provide clear label holders and white designation labels with the panel, with optional color labels available.
- R. Have circuit identification and color-coding designation strips provided with the panel.
- S. Be made by an ISO 9001 Certified Manufacturer.
- T. ANSI/TIA/EIA-568-A and ISO/IEC 11801 proposed Category 6 channel compliant.
- U. The following requirements shall also be met (NEXT Loss and FEXT tested in both Differential and Common Mode):

Parameters	Performance @ 100 MHz
NEXT Loss	43.0 dB
FEXT	35.1 dB
Insertion Loss (Attenuation)	.4 dB
Return Loss	20 dB

- V. Be UL VERIFIED for TIA/EIA Category 6 electrical performance.
 - 1. Shall be UL Verified for Category 6 compliance and be CSA C22.2 approved.
 - 2. Provide EIA/TIA 606 compliant color-coded icons or color-coded designation label strips for all patch panels. Identify voice or data functionality as required.
 - 3. Provide 48 port panels, unless otherwise noted
- Z. Paired punch down sequence to allow pair twist within ½" of the termination.
- AA. Shall have port identification numbers on front and rear of the panel.
- BB. Density must accommodate at least 24 port per single rack unit (1.75" or 44.5mm)
- CC. Have mounting slots compatible with ANSI/EIA-310.
- DD. Allows the modular insert to accept 66-style patch plugs as a means of termination.
- EE. Shall be T-568A Wired.

- FF. Provide port configurations and densities as called for on drawings.
- GG. Provide rear cable management bar(s) as recommended by the manufacturer.
- HH. Shall be Insulation Displacement Connector 66 style terminations.
- II. Provide rear stress relief components as recommended by the manufacturer.
- JJ. Be UL verified for TIA/EIA Category 6 electrical performance.
- KK. Acceptable Manufacturers or Approved Equal unless otherwise approved by the Design Consultant:
 - 1. Siemon
 - 2. Hubbell
 - 3. Panduit
 - 4. Or approved equal

2.8 FIBER OPTIC PANELS - WALL MOUNT BOX

- A. All panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- B. The wall mount interconnect center shall:
 - 1. Be available in 12,24 port termination densities for single door applications
 - 2. Be available in 12,24 and 48 port termination densities for dual door applications
 - 3. Accommodate various simplex connectors including ST®, SC, FC and LX.5
 - 4. Have single or dual hinged doors.
 - 5. Have the ability to mount the cable clamp on the interior of the panel
 - 6. Feature adapters which are angled
 - 7. Have radiused outer edges and be putty white in color
 - 8. Offer factory termination of the optical cable as an option
 - 9. Be made by an ISO 9001 certified manufacturer
 - 10. Provide port configurations and densities as called for on drawings.

2.10 FIBER OPTIC PANELS - RACK mount (low fiber count)

- A. All panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- B. Shall be available in 12 and 24 port with no splicing.
- C. Be available in 24 port configuration for splicing.
- D. Allow mounting in either 19" or 23" equipment bays.
- E. Allow flush or 5" recess mounting.
- F. Use adapter plates that house 6 adapters each.
- G. Have adapters angled to the left and right of the panel.
- H. Be available in black.

- I. Be made by an ISO 9001 certified manufacturer.
- J. Shall meet or exceed all TSB-72 requirements.
- K. Provide port configurations and densities as called for on drawings.
- L. Shall be wall or rack mountable.
- M. Shall have a hinged removable front cover.
- N. Shall feature a front access design with a hinged bulkhead plate.
- O. Shall house 6 adapters per adapter plate.

2.11 FIBER OPTIC PANELS/FRAMES - RACK MOUNT (MODERATE FIBER COUNT)

- A. All panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- B. Shall be available in 12, 24, 48, 72 and 96 port configurations.
- C. Feature a front access design with hinged bulkhead plate.
- D. Use adapter plates that house 6 adapters each.
- E. Have a hinged removable front cover.
- F. Have adapters that are angled to the left of the panel.
- G. Have an integrated vertical cableway on one side of the panel.
- H. Be mountable in flush, 1"2" and 5" recess options.
- I. Be 19" and 23" rack mountable.
- J. Have storage and splicing options as part of the product offering.
- K. Support the addition of optical components such as WDM's and splitters to the product offering.
- L. Be available in putty.
- M. Be made by an ISO 9001 certified manufacturer.
- N. Provide port configurations and densities as called for on drawings.

2.12 FIBER OPTIC FRAMES - RACK MOUNT (HIGH FIBER COUNT)

- A. All panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- B. Shall be available in putty, and made of 12-gauge aluminum alloy.

- C. Available in up to 24, 32, 48, and 72 port versions with ST® fiber adapters preloaded into adapter plates or 48, 64, 96 and 144 port versions using quad SC fiber adapters preloaded into adapter plates.
- D. Have preloaded adapter plates with SC, ST®, or LX.5 fiber adapters in 6 and 8 port versions as well as a 12 port version for the SC adapter.
- E. Have blank adapter plates for future growth of the fiber infrastructure.
- F. Have fiber managers to effectively store fiber cable slack and comply with fiber bend radius requirements.
- G. Have six and eight port fiber adapter plates, which allow for color coding connectors.
- H. Have fiber adapter plates with snap-in installation.
- I. Accommodate stackable splice trays, each tray manages a total of 24 splices.
- J. Have an adapter plate-mounting bracket, which slides out to the front and to the rear of the unit for increased access.
- K. Have cable access points for fiber jumpers entering and exiting the unit with rotating grommets to facilitate cable loading and to minimize micro bending stress.
- L. Have anchor points for fiber cable(s) entering the unit.
- M. Have labeling which meets or exceed ANSI/TIA/EIA-606 requirements and also be laser printable.
- N. Be able to mount both 19-inch and 23-inch rack/cabinets.
- O. Be UL C22.2 approved.
- P. Be made by an ISO 9001 Certified Manufacturer.
- Q. Provide port configurations and densities as called for on drawings.

2.13 FIBER OPTIC FRAMES - (HIGH FIBER COUNT)

- A. All panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- B. Shall be available in 72 and 96 port configurations.
- C. Feature termination panels with individual adapter retainers.
- D. Feature termination panels with angled adapter retainers with ½ the panel angled to the left and ½ the panel to the right.
- E. Have various termination, splice and storage units available that can be mixed and matched within a common frame.
- F. Support termination densities up to 864 per frame.
- G. Offer connector styles of SC, FC, ST® and LX.5.
- H. Be made by an ISO 9001 certified manufacturer.

- I. Provide port configurations and densities as called for on drawings.

2.14 FIBER OPTIC TRAYS - RACK MOUNT

- A. All panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- B. Rack-Mounted Fiber Tray
- C. The rack mounted fiber tray shall:
 - 1. Be made of 18-gauge steel with a black finish.
 - 2. Available in 16-, 24-, 28-, 32- and 48-port configurations, and be able to double that port count utilizing 6-port adapters.
 - 3. Accommodate SC, ST®, and LX.5 adapters.
 - 4. Accommodate hybrid adapter bezels for ST®-to-SC or SC-to-ST® connections.
 - 5. Have changeable ports, which are removed from the front of the unit to allow custom configuration or modification.
 - 6. Have silk-screened port identification numbers provided on both the front and rear of the panel.
 - 7. Include fiber managers that manage slack storage so as to comply with fiber bend radius requirements and slack storage length recommendations.
 - 8. Accommodate stackable splice trays, which manage up to 24 splices per tray.
 - 9. Have a smoked polycarbonate cover with quarter turn screws for easy access.
 - 10. Not exceed a 254 mm (10 in) depth for mounting in standard cabinets and enclosures.
 - 11. Be provided with strain relief lugs for the fiber cable entering the unit from the side or back.
 - 12. Be made by an ISO 9001 Certified Manufacturer.
 - 13. Provide port configurations and densities as called for on drawings.

2.15 BACKBOARDS

- A. Shall be 4 x 8 x ¾" ACX or BCX, exterior grade, fire rated plywood.
- B. Shall be painted – gray, acrylic, interior, fire retardant paint.
- C. Provide adequate support and dress horizontal cabling between ladder rack and 66 wiring blocks as necessary or as shown on the drawings. Review cable routing plan for the Telecommunications Rooms, in the field, before installation of cabling commences.

2.16 MODULAR 66M SYSTEM BLOCKS

- A. The connecting hardware block shall support the appropriate Category 6, applications and facilitate cross-connection and/or inter-connection using either approved cross-connect wire or patch cords.
- B. Shall be modular 66M System IDC style blocks.
- C. Be UL VERIFIED or equivalent for TIA/EIA proposed Category electrical performance.
- D. Be ANSI/TIA/EIA-568-A and ISO/IEC 11801 Category 6 compliant.

- E. The following requirements shall also be met (NEXT Loss and FEXT tested in both Differential and Common Mode):

Parameters	Performance @ 100 MHz
NEXT Loss	43.0 dB
FEXT	35.1 dB
Insertion Loss (Attenuation)	.4 dB
Return Loss	20 dB

- F. Be UL VERIFIED or equivalent for TIA/EIA proposed Category electrical performance.
- G. Be CSA C22.2 approved or equivalent.
- H. Be made of flame-retardant thermoplastic.
- I. Be available in 50-, 100-, and 300-pair sizes.
- J. Have 50-, 100, - and 300 pair blocks available without legs while the 100, and 300 pair blocks are available without legs.
- K. Blocks shall include means to identify cables/services per ANSI/TIA/EIA-606.
- L. Have clear label holders with the appropriate colored inserts available for the wiring blocks. The insert labels provided with the product shall contain vertical lines spaced on the basis of circuit size (3-, 4- or 5-pair) and shall not interfere with running, tracing or removing jumper wire/patch cords. Label holders must be capable of mounting in the under portion of the wiring block.
- M. Have connecting blocks used for either the termination of cross-connect (jumper) wire or patch cords. The connecting blocks shall be available in 3-, 4- and 5-pair sizes. All connecting blocks shall have color-coded tip and ring designation markers and be of single piece construction.
- N. Have connecting blocks with a minimum of 200 re-terminations without signal degradation below standards compliance limit.
- O. Support wire sizes: Solid 22-26 AWG (0.64 mm - 0.40 mm), and 7-strand wires.
- P. Be made by an ISO 9001 Certified Manufacturer.
- Q. Shall be 300 pair blocks, typical for feed and station cable, unless otherwise noted.
- R. Provide keep-off indicator buttons on all active cross-connected pairs used for alarm and security purposes. Coordinate the color and use with the Authority's representative.
- S. Provide connecting block designation label strips of the colors conforming to EIA/TIA 606, including but not limited to the following:

2.17 CROSS CONNECT

- A. Provide modular 66M cross connect blocks for all backbone terminations.
- B. Cross-connects shall be made with wire of equal gauge to that of the feed cable, which it is being connected to.

- C. Shall be UL listed
- D. Provide (1) roll of 1 pair and (1) roll of 2 pair per Telecommunications Room (TR). Coordinate color code of one and two pair with the Authority's representative.

2.18 POWER STRIP

- A. Shall be 20 amp, 115V.
- B. Shall be rack mounted.
- C. Shall be non-switched.
- D. Shall provide a minimum of one power strip per rack that contains active electronics, or as detailed on the drawings.
- E. Shall be surge suppressed.
- F. Shall have a minimum of 6 outlets – transformer spaced where possible.
- G. Must have 20 amp twist lock plug.
- H. Shall have a 10' cord, minimum.
- I. Shall be UL listed and must meet UL 1363 and 1449 requirements.

2.19 OPTICAL FIBER PATCH CORDS - Multimode

- A. Shall be available in standard lengths of 1, 3, and 5 meters, custom lengths shall also be available, and shall meet or exceed standards as defined in ANSI/TIA/EIA-568-A and ISO/IEC 11801.
- B. Utilize duplex optical fiber cable that is 62.5/125 or 50/125 micron multimode, OFNR riser grade, and meets the requirements of UL 1666.
- C. Utilize optical fiber cable where the attenuation shall not exceed 3.5 dB/km @ 850 nm wavelength or 1.0 dB/km @ 1300 nm.
- D. Have a cable jacket color for 62.5/125 in gray and 50/125 in orange.
- E. Be equipped with SC or ST® in accordance with TIA/EIA-568-A and must include a ceramic ferrule.
- F. Have ST® connectors with a metal coupling nut.
- G. Have terminated connectors exhibit a maximum insertion loss of 0.75 dB with an average of 0.40dB when tested at either 850 nm or 1300 nm wavelengths for 62.5/125 □m.
- H. Have terminated connectors exhibit a maximum insertion loss of 0.75 dB with an average of 0.50dB when tested at either 850 nm or 1300 nm wavelengths for 50/125 □m.
- I. Have a minimum return loss of 20 dB (25 dB typical) at both 850 nm & 1300 nm.
- J. Be made by an ISO 9001 Certified Manufacturer.

- K. Be UL 1666 approved.
- L. Shall be a duplex fiber cable meeting or exceeding the transmission characteristics of the optical fiber horizontal cable.
- M. Connectors shall be either LX.5 or duplex T568SC, as specified on the drawings or equipment schedules.
- N. Jackets shall be orange in color for multi-mode connections and yellow for single mode connections.
- O. The following configurations may be required:
 - 1. ST/ST
 - 2. SC/SC
 - 3. LX.5/LX.5
 - 4. ST/SC
 - 5. SC/LX.5
 - 6. ST/LX.5

2.20 CATEGORY 6 PATCH CORDS - MATCH COLOR OF VOICE CABLES

- A. Shall be round, and consist of eight insulated 24 AWG, stranded copper conductors, arranged in four color-coded twisted-pairs within a flame-retardant jacket.
- B. Be equipped with modular 8-position plugs on both ends, wired straight through with standards compliant wiring.
- C. Use modular plugs, which exceed FCC CFR 47 part 68 subpart F and IEC 60603-7 specifications, and have 50 microinches minimum of gold plating over nickel contacts.
- D. Be resistant to corrosion from humidity, extreme temperatures, and airborne contaminants.
- E. Utilize cable that exhibits power sum NEXT performance.
- F. Be available in several colors with or without color strain relief boots providing snagless design.
- G. Meet the flex test requirements of 1000 cycles with boots and 100 cycles without boots.
- H. Be available in any custom length and standard lengths of meters (3, 5, 7, 10, 15, 20, and 25 feet).
- I. Be made by an ISO 9001 Certified Manufacturer.
- J. Electrical Specifications:
 - 1. Input impedance without averaging 100 + 15% from 1 to 100 MHz.
 - 2. 100% transmission tested for performance up to 100 MHz. Manufacturer shall guarantee cords are compatible with Category 6 links.
 - 3. Utilize cable that is UL VERIFIED (or equivalent) for TIA/EIA proposed Category 6 electrical performance.
 - 4. UL LISTED 1863.

2.21 CATEGORY 6 PATCH CORDS - MATCH COLOR OF DATA CABLE

- A. Shall be round, and consist of eight insulated 24 AWG, stranded copper conductors, arranged in four color-coded twisted-pairs within a flame-retardant jacket.
- B. Be equipped with modular 8-position plugs on both ends, wired straight through with standards compliant wiring.
- C. Be backwards compatible with lower performing categories.
- D. Use modular plugs, which exceed FCC CFR 47 part 68 subpart F and IEC 60603-7 specifications, and have 50 microinches minimum of gold plating over nickel contacts.
- E. Have matching color strain relief boot with a snagless design which shall meet the flex testing as called out in 1000 cycles with boots and 100 cycles without boots.
- F. Be resistant to corrosion from humidity, extreme temperatures, and airborne contaminants.
- G. Utilize cable that exhibits power sum NEXT performance.
- H. Be available in any custom length and standard lengths of (3, 5, 7, 10, 15, 20, and 25 feet).
- I. Be made by an ISO 9001 Certified Manufacturer.
- J. Electrical Specifications:
 - 1. Have input impedance without averaging: 100 + 15% from 1 to 100 MHz, + 22% from 100 to 200 MHz and + 32% from 200 to 250 MHz.
 - 2. Be 100% transmission tested for performance up to 250 MHz. Manufacturer shall guarantee cords are compatible with proposed Cat-6 links.
 - 3. Utilize cable that is UL VERIFIED (or equivalent) for TIA/EIA proposed Category 6 electrical performance.
 - 4. Be UL LISTED 1863.

2.23 UNINTERUPPTABLE POWER SUPPLY (UPS)

- A. Input and Output connections of the UPS units shall be configured in accordance with the devices the unit is intended to power.
- B. Individual UPS units shall be sized to provide two (2) hours of operation for the equipment it powers.
- C. UPS units shall comply with the following specification:
 - 1. Waveform Type shall be sine wave.
 - 2. Battery Type Sealed Lead-Acid battery
 - 3. Interface Port: DB9, RS232
 - 4. Mgmt. Software Windows based with Server Shut down
 - 5. Rack Mounted.
 - 6. Acceptable Manufacturers, unless otherwise approved by the Design Consultant:
 - a. APC
 - b. Tripp Lite
 - c. Best Power
 - e. Or approved equal

PART 3 - EXECUTION

3.1 FLOOR MOUNTED RELAY RACKS

- A. All racks shall be anchored to the floor.
- B. Provide vertical and horizontal cable as shown on drawing.
- C. Mount with a minimum of 36" feet clear access behind and front of rack from the wall to a rack.
- D. Ground the rack to the equipment ground bar with a #6 copper wire.
- E. Communication grounding/earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC 1000-5-2, ANSI/TIA/EIA-607, or both be observed throughout the entire cabling system.

3.2 WALL MOUNTED RELAY RACKS

- A. Secure Wall Mounted Relay Racks to building structure with approved anchoring means.
- B. Verify all existing wall construction and submit proposed anchoring methods for approval.
- C. Provide vertical and horizontal cable management both front and rear wherever available.

3.3 LADDER RACK

- A. Ladder Rack shall be secured to walls and top of equipment rack.
- B. Communication grounding/earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC 1000-5-2, ANSI/TIA/EIA-607, or both be observed throughout the entire cabling system.

3.4 CABLE MANAGEMENT

- A. Provide horizontal and vertical cable management in each cabinet; with horizontal cable management between each piece of electronics.
- B. A horizontal crossover cable manager shall be provided at the top and bottom of each relay rack, with a minimum height of 2 rack units each.
- C. A horizontal crossover cable manager shall be provided near the center of each relay rack, with a minimum height of 4 rack units.
- D. Provide two rear cable management bars and reusable Velcro-type hook and loop straps in each rear vertical channel. Reusable straps shall be of varying sizes (each allowing 50% spare future expansion) and of adequate quantity to secure cable bundles at least every 4 rack units.
- E. Secure cable managers, slack managers, support bars, hook and loop straps per manufacturer recommendations.

3.5 CATEGORY 6 PATCH PANELS – VOICE

- A. Install and label as recommended by manufacturer per all EIA/TIA 606.
- B. Install rear cable management bar(s) as recommended by manufacturer.

- C. Install EIA/TIA 606 compliant color-coded icons or color-coded designation label strips for all patch panels. Identify voice functionality.

3.6 CATEGORY 6 PATCH PANELS – DATA

- A. Install and label as recommended by manufacturer, per all EIA/TIA 606.
- B. Install rear cable management bar(s) as recommended by manufacturer.
- C. Install EIA/TIA 606 compliant color-coded icons or color-coded designation label strips for all patch panels. Identify Data functionality.

3.7 OPTICAL FIBER PATCH PANELS

- A. Install as shown on drawings.
- B. Furnish and Install labels for each strand, as per the Authority's instruction in the field or as shown on drawings.
- C. Install blank adapter panels in all positions not used at time of installation for fiber terminations.

3.8 CABLE SUPPORTS

- A. Provide "D" rings on 2 ft. center for all exposed wall mounted vertical Category 6 cable runs.
- B. Keep horizontal wall mounted cable runs to a minimum. In general, horizontal runs shall be on wall mounted ladder rack.
- C. Provide cable brackets 3' on center supported to building structure for all cable runs not supported by cable tray.

3.9 BACKBOARDS

- A. Linear wall space used for anchoring equipment shall be lined for the full room width with plywood, per the drawings.
- B. Plywood for mounting termination equipment on shall be installed vertically, side by side, a minimum of 6" above finished floor. Mounting shall be sufficient enough to support the equipment.
- C. Plywood for supporting backbone riser cables shall be installed vertically, resting directly on the finished floor. Anchoring and mounting techniques of plywood used to support backbone riser cables shall be sufficient to support a minimum of 1000 pounds of weight.
- D. In no cases shall the heads of mounting screws protrude past the face of any plywood.
- E. Install distribution rings for the cross-connect fields above all wall mounted blocks. Two rings per vertical row of blocks. Mount rings with two hex head screws per ring.

3.10 MISCELLANEOUS REQUIREMENTS

- A. All cables shall be neatly "dressed out" in equipment rooms.
- B. Provide service loops on all cables terminated in the telecommunications rooms, per the drawings.

- C. Firestop all sleeves and conduits openings after the cable installation is complete.

3.11 MODULAT 66M SYSTEM BLOCKS

- A. Installed on plywood backboard so that top of 300 pair block is 5'6" AFF, or as noted on the drawing.
- B. Mount Blocks with steel, zinc plated 5/16" slotted hex head #10 x 3/4" drill screws, minimum four screws per block.
- C. Install designation strips color-coded in conformance with EIA/TIA 606 standard.
- D. Install insulator clips (sometimes called keep-offs) on all Life and Safety special circuits in the Telecommunications Rooms (MDF/IDF), coordinate desired color code requirements with the Authority's representative.

END OF SECTION 276600

