
STEM LAB ALTERATIONS AND RENOVATIONS AT CLEARVIEW REGIONAL MIDDLE SCHOOL

CLEARVIEW REGIONAL HIGH SCHOOL DISTRICT

Mullica Hill - Gloucester County - New Jersey



FVHD PROJECT #5162C

GILLAN & HARTMANN, INC.
Consulting Engineers

October 11, 2023

SPECIFICATIONS

for

STEM LAB ALTERATIONS AND RENOVATIONS AT CLEARVIEW REGIONAL MIDDLE SCHOOL

located at 595 Jefferson Road, Mullica Hill, NJ 08062

for the

CLEARVIEW REGIONAL HIGH SCHOOL DISTRICT

Mullica Hill, Gloucester County, New Jersey

FVHD PROJECT NO. 5162C

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TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Pages</u>
	Bid Notice	1 to 2
	BIDDING INFORMATION	
00100	Instructions to Bidders	1 to 11
	Bid Proposal Form	1 to 6
	Bidder's Checklist	1 to 2
	Bid Bond	1
	Proposition of Surety	1
	Subcontractor Identification Statement	1
	Ownership Disclosure Certification	1 to 2
	Performance Record, Certification	1 to 3
	Compliance with New Jersey Prevailing Wage Act, Certification	1 to 2
	Lowest Responsible Bidder by 10% or More Certification of Prevailing Wage Rates and Acknowledgment of Penalties Form	1
	Non Collusion Affidavit	1
	Certification of No Material Change of Circumstances	1
	Status of Present Contracts	1
	Political Contribution Disclosure Instructions, Form	1 to 2
	Disclosure of Investment Activities in Iran	1
	Equipment Certification	1
	Sworn Contractor Certification; Qualifications and Credentials	1
	Certification of Insurance Statement	1
	Federal and State Non-Debarment Certification	1
	Certification of Non-Debarment for Federal Government Contracts	1 to 4
	Sample Surety Disclosure Statement and Certification	1 to 2
	Performance Bond	1
	Payment Bond	1
	Maintenance Bond	1 to 2
	Form AA-201 Initial Project Workforce Report Construction	1
	Form AA-202 Monthly Project Workforce Report Construction	1
	AIA Document A101 - 2017, Standard Form of Agreement Between Owner and Contractor	1 to 8
	AIA Document A101 - 2017, Exhibit A Insurance and Bonds	1 to 6
	CONTRACT CONDITIONS AND GENERAL REQUIREMENTS	
00700	AIA Document A201 - 2017, General Conditions of the Contract for Construction	1 to 55
00800	Supplementary General Conditions	1 to 8
00850	Contract Drawings	1
00860	Laws Governing Public Work	1 to 14
	Exhibit B - Mandatory Equal Employment Opportunity Language	1 to 3
00870	Miscellaneous Requirements	1 to 3
01010	Summary of Work	1 to 5

TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Pages</u>
01020	Allowances	1 to 2
01040	Coordination	1 to 11
01050	Alterations, Cutting, Patching and Refinishing Work	1 to 11
01151	Unit Prices	1 to 6
01200	Project Meetings	1 to 4
01400	Material Testing/Quality Control Services	1 to 7
01410	References and Industry Standards	1 to 3
01455	Concrete In-Situ Relative Humidity and pH Testing	1 to 3
01505	Temporary Facilities	1 to 2
01524	Construction Waste Management	1 to 5
01600	Product Requirements	1 to 7
01700	Project Closeout Documents and Procedures	1 to 13
	Sample Closeout Checklist	1
01800	Time of Completion and Liquidated Damages	1 to 4
01900	Guarantees and Warranties	1 to 9
 GENERAL CONSTRUCTION WORK		
02070	Selective Demolition	1 to 5
02514	Sitework Concrete	1 to 7
03300	Concrete Work	1 to 11
03450	Self-Drying Finishing Underlayment	1 to 5
04200	Unit Masonry	1 to 17
05400	Miscellaneous Structural Steel	1 to 6
05500	Metal Fabrications	1 to 12
06100	Carpentry	1 to 5
06650	Solid Polymer Fabrications	1 to 5
07200	Building Insulation	1 to 4
07535	Repairs to Modified Bitumen Roofing System - Cold Applied	1 to 13
	Roof Warranty	1 to 3
07270	Fluid Applied Air / Vapor Barriers	1 to 14
07840	Through-Penetration Firestop Systems	1 to 8
07900	Joint Sealer Assemblies	1 to 8
08110	Hollow Metalwork	1 to 5
08211	Wood Doors	1 to 8
08410	Aluminum / FRP Doors	1 to 10
08415	Aluminum Storefronts	1 to 12
08700	Finish Hardware	1 to 18
08800	Glass and Glazing	1 to 9
09250	Gypsum Drywall	1 to 9
09510	Acoustical Ceilings	1 to 6
09650	Resilient Flooring	1 to 9
09900	Painting	1 to 10
10100	Dry Markerboards and Exhibition Boards	1 to 7

TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Pages</u>
10440	Specialty Signs.	1 to 4
10522	Fire Extinguishers, Cabinets and Accessories.	1 to 3
10670	Metal Shelving.	1 to 2
10900	Miscellaneous Equipment and Furnishings.	1 to 3
11000	General Requirements - Casework and Equipment Work	1 to 5
11011	Casework and Equipment	1 to 12
12496	Window Roller Shades.	1 to 14
 PLUMBING WORK		
220010	General Requirements Plumbing.	1 to 36
220513	Common Motor Requirements for Plumbing Equipment.	1 to 2
220517	Sleeves and Sleeve Seals for Plumbing Piping	1 to 4
220518	Escutcheons for Plumbing Piping	1 to 3
220523.12	Ball Valves for Plumbing Piping.	1 to 5
220523.14	Check Valves for Plumbing Piping	1 to 4
220529	Hangers and Supports for Plumbing Piping and Equipment.	1 to 7
220553	Identification for Plumbing Piping and Equipment	1 to 4
220593	Testing, Adjusting and Balancing for Plumbing	1 to 9
220719	Plumbing Piping Insulation.	1 to 12
221116	Domestic Water Piping	1 to 7
221119	Domestic Water Piping Specialties.	1 to 5
221316	Sanitary Waste and Vent Piping	1 to 8
221319	Sanitary Waste Pipe Specialties.	1 to 2
221319.13	Sanitary Drains	1 to 5
221343	Facility Packaged Sewage Pumping Stations	1 to 6
224216.16	Commercial Sinks	1 to 5
224500	Emergency Plumbing Fixtures	1 to 5
 MECHANICAL WORK		
230010	General Requirements HVAC	1 to 38
230553	Identification for HVAC Piping and Equipment.	1 to 5
230593	Testing, Adjusting, Balancing for HVAC	1 to 17
230713	Duct Insulation	1 to 11
230719	HVAC Piping Insulation	1 to 12
232113	Hydronic Piping	1 to 7
232116	Hydronic Piping Specialties.	1 to 2
233113	Ductwork.	1 to 9
233300	Duct Accessories	1 to 5
233713	Air Diffusers Registers and Grilles	1 to 4
237416	Packaged, Rooftop Air-conditioning Units with Heat Recovery.	1 to 12
237433	Dedicated Outdoor Air Units	1 to 12
238239	Cabinet Unit Heaters	1 to 3

TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Pages</u>
ELECTRICAL WORK		
260010	General Requirements Electrical	1 to 46
260050	Basic Electrical Materials and Methods.	1 to 9
260519	Low Voltage Electrical Power Conductors and Cables.	1 to 5
260526	Grounding and Bonding for Electrical Systems	1 to 6
260533	Raceways and Boxes for Electrical Systems	1 to 8
260923	Digital Programmed Lighting Control Devices.	1 to 6
262726	Wiring Devices	1 to 5
262816	Enclosed Switches and Circuit Breakers for Existing Panels	1 to 4
265119	LED Interior Lighting	1 to 6
271513	Communications Copper Horizontal Cabling	1 to 9

END TABLE OF CONTENTS

NOTICE TO BIDDERS
Clearview Regional High School District
Gloucester County, New Jersey

NOTICE IS HEREBY GIVEN that the Clearview Regional Board of Education (“Owner”) will receive bids for **STEM Lab Alterations and Renovations at Clearview Regional Middle School**, together with all work incidental thereto, in accordance with the requirements of the drawings and specifications prepared by Fraytak Veisz Hopkins Duthie, P.C. (FVHD), Architects-Planners, www.fvhdpc.com, **FVHD Project #5162C**.

Bids will be received for: Single Overall Contract (C008 or C009 with C030, C032, C047)

Sealed Bids are due by **Wednesday, November 8, 2023, 2:00 PM** to the Clearview Regional Board of Education, 420 Cedar Road, Mullica Hill, NJ 08062, and will be publicly opened and read immediately thereafter. Any Bid received after that time shall be rejected.

Prebid Meeting is scheduled for **Wednesday, October 18, 2023, 2:00 PM**, at the Clearview Regional Middle School, 595 Jefferson Road, Mullica Hill, NJ 08062. Check in at Main Office. Attendance at the prebid meeting optional but encouraged.

Bid Documents for the proposed Work are on file at the office of the Architect, Fraytak Veisz Hopkins Duthie, P.C., 1515 Lower Ferry Road, Trenton, NJ 08618, tel. 609.883.7101. To obtain Bid Documents, complete and submit the Bidder Registration form to info@fvhdpc.com, which can be download from <https://fvhdpc.com/bids/bidlisting>. No fee electronically, \$25.00 DVD, \$250.00 hard copy. Check or money order payable to Fraytak Veisz Hopkins Duthie, P.C. If Contractor requests shipping, a direct shipping account number (FedEx or UPS) and preferred shipping speed must be provided and for paper sets, a separate fee of \$25.00 per set. All fees are non-refundable.

All requests for information (RFI) must be submitted in writing by **October 25, 2023**, and sent to cwoodward@fvhdpc.com, or fax to 609-883-2694 or via common carrier to the Architect. All correspondence must include the Architect Project Name and Project Number referenced. The Architect is not responsible for misdirected or misrouted correspondence.

Bid Proposal shall be submitted in duplicate (one original and one copy) in a sealed envelope, addressed to the Owner, bearing the name and address of the bidder, and clearly marked “**BID**” with the contract title and/or bid number on the outside of the envelope and must be accompanied by a Certified Check, Cashier's Check or Bid Bond drawn to the order of the Owner in the amount of ten percent (10%) of the amount of the bid, but in no case in excess of \$20,000; and must be delivered to the above place on or before the hour named. The Board of Education and the Architect assume no responsibility for bids mailed or misdirected in delivery.

If the bid exceeds \$20,000 bidder must be pre-qualified by the New Jersey Division of Property Management and Construction (DPMC), prior to the date that bids are received. Any bid submitted under the terms of New Jersey statutes not including a copy of a valid and active Pre-qualification/Classification Certificate shall be rejected as being non-responsive to bid requirements.

Pursuant to N.J.S.A. 18A:18A-25, each proposal shall be accompanied by a Proposition of Surety from a Surety Company stating it will provide each bidder with separate Performance and Payment Bonds, each in the amount of 100% of the contract sum. Also, Surety agrees to furnish bidder with a Maintenance Bond in required form. The Proposition of Surety shall be executed by an approved surety company authorized to do business in the State of New Jersey and in accordance with N.J.S.A. 2A:44-143, and 2A:44-144 and with the three highest rating categories of rating companies nationally recognized.

This project is subject to the New Jersey State Prevailing Wage Act, N.J.S.A. 34:11-56.27 et seq. All bidders must comply with N.J.S.A. 10:5-31 et seq., N.J.A.C. 17:27 et seq. and N.J.S.A. 10:2-1. An Initial Project Workforce Report will be required from the successful bidder (Form AA-201).

Pursuant to "The Public Works Contractor Registration Act", N.J.S.A. 34:11-56.48 et seq., bidders and their subcontractors are required to be registered with the New Jersey Department of Labor and Workforce Development and to possess a current certificate by said Department indicating compliance with the Act prior to the time and date that bids are received.

Per N.J.S.A. 52:32-44(b) all contractors and subcontractors must provide a Business Registration Certificate prior to contract award and other document requirements in the bid request.

No bid may be withdrawn for a period of sixty (60) days after the date set for the opening thereof. The right is reserved to reject all bids pursuant to N.J.S.A. 18A:18A-22 and to waive minor informalities in the bidding in accordance with applicable law.

By Order of the Clearview Regional Board of Education
Esther Pennell, CPA
Business Administrator/Board Secretary

BIDDING INFORMATION

SECTION 00100 - INSTRUCTIONS TO BIDDERS

1.1 INVITATION TO BID

- A. All Bidders are required to prepare bids in accordance with all plans and specifications (Bid Documents) prepared by Fraytak Veisz Hopkins Duthie, P.C.

DISCLAIMER: Bidders should only rely on original digital and paper versions of the bidding contract documents obtained directly from the Architect's office. Fraytak Veisz Hopkins Duthie, PC (FVHD) Architects-Planners is not responsible for any unauthorized copies made of the digital or paper bidding contract documents obtained from sources other than the Architect's office. All information provided by Fraytak Veisz Hopkins Duthie, PC (FVHD) Architects-Planners is intellectual property and is protected under copyright laws. It is not to be used for any purpose other than for the indicated project. Any other use or manipulation of the information is strictly prohibited.

FVHD will issue a notice of revisions (Addendum) made to the contract documents during the bid period to Contractors who have obtained contract documents from FVHD. Contractors will be responsible to download the applicable Addendum(s) from designated website. Contractors who do not acknowledge receipt of Addendum(s) on the bid form may have their bid deemed non-responsive by the Owner's Attorney.

- B. Proposals for Contracts as listed in the Advertisement for Bids or Invitation to Bid as hereinafter described, will be received for the performance of the Project. The bids shall cover all cost of any nature, incident to and growing out of the work. In explanation but not in limitation thereof, these costs shall include the cost of all work, labor, materials, equipment, transportation and cost of all else necessary to perform and complete the Project in the manner and within the time required, all incidental expenses in connection therewith, all costs on account of loss by damage or destruction of the Project to the extent that the cost of such loss is not recovered from insurance carried by the Owner and the Contractor, and any additional expenses for unforeseen difficulties encountered, for settlement of damages and for replacement of defective work and materials.
- C. Before submitting a Proposal, the Bidder shall become familiar with the Drawings, Specifications and other documents that will form the Contract, shall investigate the site of the Project and make such examination thereof as may be necessary to determine the character and amount of work involved. The Bidder shall also determine that he/she can secure the necessary labor and equipment and that the materials he/she proposes to use will comply with the requirements specified therefor and can be obtained by him/her in the quantities and at the time required.

- D. The Owner reserves the right to accept or reject any or all bids including Alternate Bids, if any, under any Contract for a period up to sixty (60) days after receipt of bids or as otherwise agreed in accordance with applicable law.

1.2 ETHICS IN PURCHASING

A. School District Responsibility

1. Recommendation of Purchases

- a. It is the desire of the Board of Education to have all Board employees and officials practice exemplary ethical behavior in the procurement of goods, materials, supplies, and services.
- b. School district officials and employees who recommend purchases shall not extend any favoritism to any vendor. Each recommended purchase should be based upon quality of the items, service, price, delivery, and other applicable factors in full compliance with N.J.S.A. 18A:18A-26-33 et seq.
- c. Solicitation/Receipt of Gifts - Prohibited:
 - 1) School district officials and employees are prohibited from soliciting and receiving funds, gifts, materials, goods, services, favors, and any other items of value from vendors doing business with the Board of Education or anyone proposing to do business with the Board of Education.

2. Vendor Responsibility:

- a. Offer of Gifts, Gratuities – Prohibited
 - 1) Any vendor doing business or proposing to do business with the Board of Education, shall neither pay, offer to pay, either directly or indirectly, any fee, commission, or compensation, nor offer any gift, gratuity, or other thing of value of any kind to any official or employee of the Board of Education or to any member of the official's or employee's immediate family.
- b. Vendor Influence – Prohibited:
 - 1) No vendor shall cause to influence or attempt to cause to influence, any official or employee of the Board of Education, in any manner which might tend to impair the objectivity or independence of judgment of said official or employee.

3. Vendor Certification:

- a. Vendors or potential vendors will be asked to certify that no official or employee of the Board of Education or immediate family members are directly or indirectly interested in this request or have any interest in any portions of profits thereof. The vendor participating in this request must be an independent vendor and not an official or employee of the Board of Education.

1.3 OBLIGATION OF BIDDER

- A. At the time of the opening of bids each Bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Drawings and other Contract Documents, including all Addenda and Bulletins. The failure or omission of any Bidder to receive or examine any form, instrument or document or to visit the site and acquaint himself/herself with conditions there existing, shall not relieve any Bidder from obligation with respect to his bid.
- B. Any and all discrepancies between the drawings and specifications or between trades shall be brought to the attention of the Architect prior to the Contractor's bid submission.

1.4 CHALLENGES TO BID SPECIFICATIONS (N.J.S.A. 18A:18A-15)

- A. Any prospective bidder who wishes to challenge a bid specification shall file such challenges in writing with the School Business Administrator/Board Secretary no less than three (3) business days prior to the opening of bids. Challenges filed after that date shall be considered void and having no impact on the Board of Education or the award of a contract.

1.5 NOTICE OF CLASSIFICATION OF BIDDERS (CONTRACTORS AND SUBCONTRACTORS)

- A. Pursuant to N.J.S.A. 18A:18A-26 et seq., as amended, and N.J.A.C. 17:19-2.1 through N.J.A.C. 17:19-2.7, Bidders on any Contract on public work for a Board of Education in the State of New Jersey in which the entire cost of the Contract exceeds \$20,000.00, must have a classification from the Division of Property Management and Construction (DPMC), as to character and amount of public work on which they may submit bids. Bidder must submit, a "Notice of Classification" setting forth the type of work and the amount of work for which the bidder has been qualified, that there has been no material adverse change in their qualification information, the total amount of uncompleted work on contracts at the time and the date of the bid due date. Any bidder who does not possess a valid and active "Notice of Classification" shall be ineligible to bid on this project, and any bid submitted by such bidder shall be rejected as non-responsive. (Forms for this purpose are available from the Director of the Division of Property Management and Construction - DPMC, Trenton, New Jersey 08625.)
 - 1. Each classified bidder's aggregate rating shall be calculated in accordance with formula prescribed by N.J.A.C. 17:19-2.8.
 - a. Calculations shall be based on Bidder's base bid amount at time of bid or total amount of base bid and accepted Alternate Bids at time of Award.
- B. In accordance with N.J.S.A. 34:11-56.48 et seq. and N.J.S.A. 18A:7G-37, each bidder must be properly registered with the New Jersey Department of Labor and Workforce Development at the time of the bid. The Contractor shall enter into

subcontracts only with subcontractors who are registered pursuant to N.J.S.A. 34:11-56.48 et seq.

1. No Contractor/Subcontractor will be permitted to bid on or engage in any contract for public work, as defined in the "New Jersey Prevailing Wage Act," N.J.S.A. 34:11-56.26 et seq., unless that Contractor/ Subcontractor is registered with the New Jersey Department of Labor and Workforce Development at the time of the bid.
- C. The Owner may make such additional investigations as it deems necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that they are properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein.

1.6 TOTAL AMOUNT OF UNCOMPLETED CONTRACTS

- A. Uncompleted Contracts (For Contracts Exceeding \$20,000) (N.J.A.C. 17:19-2.13(a))
1. The Board requires that each bidder submit with his/her bid, a certified Total Amount of Uncompleted Contracts form as prescribed by the cited regulation. (Form DPMC 701). Failure to submit this document will lead to having the bid being rejected as non-responsive.

1.7 CHANGES TO BID DOCUMENTS, INTERPRETATIONS AND ADDENDA

- A. Changes to the Bid Documents may be required to be issued via Addenda. FVHD will issue notice of the publication of all Addenda to prospective bidders, who have obtained bid documents from FVHD. **All bidders are to check the FVHD website www.fvhdpc.com and download addenda if any are issued for the project.**
1. All Addenda issued become a part of the Bid Documents and will be part of the Contract Documents as though originally incorporated into the Project Manual.
 2. A notification of Addenda changes to the bid documents will be faxed to all bidders who have received bid documents from FVHD Architects. Bidders will be responsible to download the applicable Addendum(s) from the Architects website at www.fvhdpc.com/bids/bidlisting.aspx.
 3. Bidders must acknowledge receipt of all Addenda on the Bid Form or the bid may be deemed non-responsive by the Owner's Attorney.
- B. Pre-bid Request for Information: No oral interpretations will be made to any Bidder as to the meaning of the drawings and specifications. **All requests for information**

(RFI's) must be submitted in writing by October 25, 2023 and sent by faxing to 609-883-2694; by emailing cwoodward@fvhdpc.com; or sent via common carrier to the Architect. All correspondence must include the Architect's Project Name and Project Number. The Architect is not responsible for misdirected or misrouted correspondence.

Fraytak Veisz Hopkins Duthie, P.C.

Architects / Planners

1515 Lower Ferry Rd., Trenton, NJ 08618

Electronic Facsimile (609) 883-2694

FVHD Project No. 5162C

1. Every interpretation made to a Bidder will be in the form of an Addendum. During the bidding period, the Architect may furnish Addenda for additions to or alterations of the drawings and specifications, which shall be included in the work covered by the Bid Form(s).
2. Addenda, when issued, will be made available no later than seven (7) business days prior to the date for receiving bids, Saturday, Sunday or holidays excepted, to all persons who have obtained Bid Documents from the Architect.
3. Addenda will also be available for examination at the Architect's office.
4. It shall be the responsibility of the Bidder to ascertain that they have received and examined all Addenda and Bulletins issued, prior to submitting their bid. Failure of the Bidder to download and examine all Addenda shall not relieve the Bidder from any of the requirements of the Bid Documents.
5. All addenda will be issued in accordance with N.J.S.A. 18A:18A-21(c).

1.8 PREPARATION OF BIDS

- A. Enclose **two copies (one original and one copy)** of the Bid in a sealed envelope, identified on the outside of the envelope and clearly marked "BID" with the name and address of the bidder, name of the project and contract number in which the bidder is submitting.
- B. Bids shall be submitted on the form of Bid furnished by the Architect, properly filled out and duly executed. Bid forms shall not be altered or added to in any way. Lump Sum Bid or Base Bid prices shall be filled in, in ink or typewritten, in both words and figures. In case of discrepancy, the amount described in words shall govern.
 1. Bids containing any conditions, omissions, unexplained erasure or alteration, items not called for in the Bid Form, attachment of additive information not required by the Specifications, or irregularities of any kind may be rejected by the Owner.

2. **Any changes, white-outs, strike-outs, etc. on the Bid Form must be initialed in ink by the person responsible for signing the Bid Form.**
- C. When the bid is made by an individual, his/her post office address shall be stated and he/she shall sign the proposal. When made by a firm or partnership, its name and post office address shall be stated and the Bid shall be signed by one or more of the partners. When made by a corporation, its name and principal post office address shall be stated, and the Bid shall be signed by an authorized official of the corporation.
- D. Alternate Bids and Unit Prices for the various portions of work or Contract(s) shall be as stated in other Sections of the Specifications.
1. Attention is called particularly to the requirements for filling in all Alternate Bids called for on the Bid Form, as the Owner reserves the right to award a Contract based upon the possible inclusion of one or more such Alternate Bids.
 2. The amounts of the Alternate Bids shall include any and all modifications to related, adjacent or surrounding work made necessary by use of such Alternate Bids.
 3. The Alternate Bids must be stated as additions to or deductions from the Base Bid, unless otherwise noted.
 4. **The term "No Bid" shall not be used with respect to Alternate Bids and Unit Prices requested on the Bid Forms. The Bidder who does not desire to make a change from the Base Bid under a particular Alternate Bid shall so indicate by using the words "No Change." Failure to bid or use of the term "No Bid" on any Alternate shall cause rejection of entire bid.**
 5. Bidders must bid on every alternate bid. Additions to, or deductions from, the base bid shall be indicated in the appropriate blanks on the Bid form with additions to or deductions from the base bid filled in as appropriate. If a particular alternate bid does not result in an addition to or deduction from the base bid, the words "No Change" or N/C" shall be written in the blank for "No Change" on the Bid form, and the words "No Change" shall be written in the blank provided for the purpose of stating the numeric amount in words. Failure to bid on every alternate bid shall render the bid nonresponsive and shall cause the bid to be rejected.
- E. Conditions, limitations or provisos attached by the Bidder to the Bid may cause its rejection.

1.9 BID GUARANTEE

- A. The Bid, when submitted, shall be accompanied by a Bid Guarantee in the form of a Certified Check, Cashier's Check or acceptable Bid Bond made payable

unconditionally to the Owner, in the sum of ten percent (10%) of the Bid Proposal, but in no case in excess of \$20,000.00 and as per Bid Bond Form included:

1. Bid Bond Form: Bid Bond shall be as per bid form included and shall include an effective and current Power of Attorney authorizing the Attorney-in Fact to bind the surety, on Bid Date and Time, for the full amount of the Bond.
 2. Bid shall be accompanied by a Proposition of Surety in accordance with paragraph 1.11.
- B. Pursuant to N.J.S.A. 18A:18A-36, all Bid Guarantees, except those of the three apparent lowest responsible bidders, will be returned, if requested, after ten (10) days from opening of bids, Sundays and holidays excepted. Within three (3) days after the awarding of the contract and the approval of the Contractor's performance bond and payment bond, the bid security of the remaining unsuccessful bidders will be returned to him/her (Sundays and holidays excepted).
- C. The Bid Guarantee shall be forfeited if successful Bidder fails to execute the Agreement between Owner and Contractor identified in Section 9 hereof and furnish the Performance-Payment Bond within ten (10) days after notification of award of Contract to him/her (Sundays and holidays excepted).
1. Any failure by the successful bidder to perform its obligations regarding the time, manner, and substance of compliance with Bidding Documents in relation to the Award of a Contract, shall constitute an Event of Default, entitling the Owner to:
 - a. Demand, from said guarantor, immediate payment of the entire Bid Bond amount, as liquidated damages, not as a penalty, for the delay acknowledged and agreed that the Owner will sustain in connection with said Default; and addition thereto,
 - b. Recovery of any and all other Losses incurred by the Owner, to which the Owner shall, to the fullest extent permitted by Applicable Law, be entitled to recover, including without limitation Special Damages.

1.10 CONTRACT BONDS

- A. Pursuant to N.J.S.A. 18A:18A-25, Bids shall be accompanied by a Proposition of Surety in form as bound in these documents, assuring that satisfactory arrangements have been made between the surety and the Bidder by which surety agrees to furnish Bidder with a Performance Bond and Payment Bond; each in the amount of 100% of the amount bid. Also surety agrees to furnish Bidder with a in form as bound herein.
- B. The Bidder to whom the Contract has been awarded shall, within ten (10) days after notification of award of contract to him/her, furnish and deliver a Performance Bond and Payment Bond, each equal to one hundred percent (100%) of the Contract Amount. If, at any time after execution and approval of a Contract and

Performance-Payment Bond required by Contract Documents, such Bond shall cease to be adequate security for the Owner, the Contractor shall, within five (5) days after notice to do so, furnish a new or additional Bond, in form, sum and signed by such Sureties as shall be satisfactory to the Owner. No further payment shall be deemed due nor shall any further payment be made to the Contractor unless and until such new or additional Bond shall be furnished and approved.

1. The Proposition of Surety shall be executed by an approved surety company authorized to do business in the State of New Jersey and in accordance P.L. 1995, c.384 (amending N.J.S.A. 2A:44-143 and 2A:44-144, effective January 10, 1996) and with the three highest rating categories of rating companies nationally recognized and listed as per Appendix A (go to www.nj.gov/dobi/surety.htm).
- B. Prior to start of guarantee period and before the final payment is made, the Contractor shall provide the Owner with a Maintenance Bond in amount of 10% of the Final Contract Sum, to insure the replacement or repair of defective materials or workmanship during the two (2) year guarantee period.
- C. The cost of all Bonds shall be paid for by the Contractor and shall be included as a part of Contractor's bid price.

1.11 POWER OF ATTORNEY

- A. Attorneys-in-fact who sign Bid Bonds, Performance and Payment Bonds, Maintenance Bonds and Proposition of Surety forms must accompany each bond or proposition with a certified and effectively dated copy of their power-of-attorney.

1.12 FORM OF AGREEMENT

- A. The form of agreement shall be AIA Document A101 Standard Form of Agreement between Owner and Contractor, (Stipulated Sum) 2017 Edition, and in accordance with AIA Document A201 General Conditions of the Contract, 2017 Edition as amended, and all other documents referenced herein.

1.13 AWARD OF CONTRACT

- A. Award, if made, will be to the lowest responsive and responsible bidder for the Single Overall Building Contract selected to include Alternate Bids, if any, which the Owner chooses to accept, that results in the lowest aggregate total sum.
- B. Award made to a Bidder not a resident of the State of New Jersey is conditioned upon Bidder designating a proper agent in the State of New Jersey on whom service can be made in the event of litigation.
- C. If the successful Bidder is a corporation not organized under the laws of New Jersey, the award of Contract and payment of consideration thereunder shall be

conditioned upon Corporation promptly filing a certificate of doing business in the State of New Jersey pursuant to N.J.S.A. 14A:13-2 and complying with the provisions of N.J.S.A.14A:13-4.

- D. The Owner reserves the right to reject any or all bids, or to waive non-material defect in the bidding, in accordance with applicable law.
- E. In accordance with requirements of the N.J.S.A. 18A:18A-36b, execution of the Contract by all parties will be done within 21 days of the notification of the award date.
 - 1. The Bidder to whom contract is awarded shall be required to execute said Contract within ten (10) days of the notification of award date of Contract to him/her.
- F. Upon award of the Contract, the Contractor shall execute and return to the Owner the "Contractor Certification and Consent Upon Award of Contract".

1.14 BIDDING DOCUMENTS

- A. The Bidding Documents consist of but not limited to the following:
 - 1. Instructions To Bidders in accordance with this Section,
 - 2. General Conditions, AIA Document A201, and as supplemented in the Supplementary General Conditions; Section 00800,
 - 3. Proposal Form including attachments as per Bidder's Checklist,
 - 4. Erratum, Addenda , if issued,
 - 5. Specifications: As outlined in the "Index" included in the Project Manual,
 - 6. Drawings: As per List of Drawings indicated on Project Title Sheet and in accordance with Section 00850,
 - 7. Agreement Between Owner & Contractor, AIA Document A101 and as amended by the Project Specifications.
- B. Note: The above list is not intended to establish order of precedence.

1.15 TIME OF COMPLETION AND LIQUIDATED DAMAGES

- A. Refer to Section 01800, "Time of Completion and Liquidated Damages".

1.16 LISTING OF STOCKHOLDERS, PARTNERS OR MEMBERS

- A. Pursuant to N.J.S.A. 52:25-24.2, no corporation, partnership, or limited liability company shall be awarded any contract nor shall any agreement be entered into for the performance of any work or the furnishing of any materials or supplies, the cost of which is to be paid with or out of any public funds, by the State, or any county, municipality or school district, or any subsidiary or agency of the State, or of any county, municipality or school district, or by any authority, board, or commission which exercises governmental functions, unless prior to the receipt of the bid or accompanying the bid, of said corporation, said partnership, or said limited liability company there is submitted a statement setting forth the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be. If one or more such stockholder or partner or member is itself a corporation or partnership or limited liability company, the stockholders holding 10 percent or more of that corporation's stock, or the individual partners owning 10 percent or greater interest in that partnership, or the members owning 10 percent or greater interest in that limited liability company, as the case may be, shall also be listed. The disclosure shall be continued until names and addresses of every noncorporate stockholder, and individual partner, and member, exceeding the 10 percent ownership criteria established in this act, has been listed.
- B. To comply with this section, a bidder with any direct or indirect parent entity which is publicly traded may submit the name and address of each publicly traded entity and the name and address of each person that holds a 10 percent or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, and, if there is any person that holds a 10 percent or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a 10 percent or greater beneficial interest.

1.17 NON-COLLUSION AFFIDAVIT

- A. Pursuant to N.J.S.A. 52:34-15, bidder shall submit with his/her bid Non-Collusion Affidavit on form as bound herein.

1.18 CONTRACT

- A. As indicated in the Advertisement for Bids, it is intended to receive sealed bids and to award and administrate contract for the work required by the Contract Documents as follows:

Single Overall Contract

- B. The Bidder shall be a firm classified by the State of New Jersey - Division of Property Management and Construction for the following classification:

Prime General Contractor

C008 - General Construction

or

C009 - General Construction/Alterations and Additions

and have subcontractor(s) for the following classification(s) of work:

Subcontractors:

C030 - Plumbing

C032 - HVACR

C047 - Electrical

- C. Pursuant to N.J.S.A. 18A:18A-26, the Bidder shall be in possession of the required DPMC Classification for the specified work.

1. In the case of a Combined Single Overall Bid, if the contractor possess the DPMC Classification in one category, but not in all of the required categories, the Contractor must list the Prime Subcontractor(s) bidding the scope of work for the other categories. The Subcontractor(s) must possess the DPMC Classification(s) in that category.

END OF SECTION 00100

BID PROPOSAL FORM

SINGLE OVERALL CONTRACT

**DPMC Classification(s): C008 or C009 Prime Contractor
with C030, C032, C047 Subcontractors**

Clearview Regional High School District
Board of Education
420 Cedar Road
Mullica Hill, NJ 08062-9436

1. The undersigned, having familiarized himself with the local conditions affecting the cost of the work, the drawings, the specifications and other Contract Documents, as in the Advertisement for Bids thereto, for the **STEM Lab Alterations and Renovations at Clearview Regional Middle School (FVHD-5162C)** 595 Jefferson Road, Mullica Hill, NJ 08062, together with all work incidental thereto, in accordance with the requirements of the drawings and specifications prepared by Fraytak Veisz Hopkins Duthie, P.C., Architects/Planners, Trenton, New Jersey, hereby proposes to furnish all labor, materials and equipment required for all Work and as follows.

SINGLE OVERALL CONTRACT - LUMP SUM BID: All Work at the above referenced school, including applicable Allowances - Section 01020, in accordance with the requirements of Contract Documents, for the sum of:

Total Lump Sum Bid including Allowance \$ _____
(Numerical)

If written amount differs from the numerical figure, only the written amount will be accepted as the correct bid.

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Submitted by: _____
(Firm Name)

2. UNIT PRICES - SECTION 01151: Materials in Place.

Bulk rock excavation \$ 300.00 per cu. yd.

Trench or pit rock excavation \$ 400.00 per cu. yd.

UNIT PRICES - GENERAL CONSTRUCTION: Materials in Place.

Excavation (unsuitable soil) \$ _____ per cu. yd.

Compacted fill \$ _____ per cu. yd.

Concrete Walk (including subbase) \$ _____ per sq. ft.

Self-Drying Finishing Underlayment per Section 03450 \$ _____ per sq. ft.

Replacement of existing damaged or deteriorated metal decking \$ _____ per sq. ft.

Replacement of existing wet or deteriorated roof insulation board \$ _____ per sq. ft.

Replacement of existing damaged or deteriorated wood nailers / blocking or framing, including removal of existing deteriorated wood, furnishing and installing new galvanized anchor bolts, expansion bolts at 4'-0" o.c. or nails through existing construction to remain: \$ 2.90 per board ft.

- a. 2x4 for the above work \$ _____ per lin. ft.
- b. 2x6 for the above work \$ _____ per lin. ft.
- c. 2x8 for the above work \$ _____ per lin. ft.
- d. 2x10 for the above work \$ _____ per lin. ft.
- e. 2x12 for the above work \$ _____ per lin. ft.

UNIT PRICES - PLUMBING & DRAINAGE: Materials in Place.

1-1/4" sanitary and vent pipe above grade \$ _____ per lin. ft.

1-1/2" sanitary and vent pipe above grade \$ _____ per lin. ft.

2" sanitary and vent pipe above grade \$ _____ per lin. ft.

1/2" domestic hot or recirc water pipe above ground with insulation \$ _____ per lin. ft.

3/4" domestic hot or recirc water pipe above ground with insulation \$ _____ per lin. ft.

1" domestic hot or recirc water pipe above ground with insulation \$ _____ per lin. ft.

1-1/4" domestic hot or recirc water pipe above ground with insulation \$ _____ per lin. ft.

1-1/2" domestic hot or recirc water pipe above ground with insulation \$ _____ per lin. ft.

2" domestic hot or recirc water pipe above ground with insulation \$ _____ per lin. ft.

1/2" domestic cold water pipe above ground with insulation \$ _____ per lin. ft.

3/4" domestic cold water pipe above ground with insulation \$ _____ per lin. ft.

1" domestic cold water pipe above ground with insulation \$ _____ per lin. ft.

Submitted by: _____
(Firm Name)

1-1/4" domestic cold water pipe above ground with insulation	\$ _____ per lin. ft.
1-1/2" domestic cold water pipe above ground with insulation	\$ _____ per lin. ft.
2" domestic cold water pipe above ground with insulation	\$ _____ per lin. ft.
1/2" domestic cold water pipe insulation	\$ _____ per lin. ft.
3/4" domestic cold water pipe insulation	\$ _____ per lin. ft.
1" domestic cold water pipe insulation	\$ _____ per lin. ft.
1-1/4" domestic cold water pipe insulation	\$ _____ per lin. ft.
1-1/2" domestic cold water pipe insulation	\$ _____ per lin. ft.
2" domestic cold water pipe insulation	\$ _____ per lin. ft.
1/2" domestic hot or recirc water pipe insulation	\$ _____ per lin. ft.
3/4" domestic hot or recirc water pipe insulation	\$ _____ per lin. ft.
1" domestic hot or recirc water pipe insulation	\$ _____ per lin. ft.
1-1/4" domestic hot or recirc water pipe insulation	\$ _____ per lin. ft.
1/2" Type "L" copper tubing	\$ _____ per lin. ft.
3/4" Type "L" copper tubing	\$ _____ per lin. ft.
1" Type "L" copper tubing	\$ _____ per lin. ft.
1-1/2" Type "L" copper tubing	\$ _____ per lin. ft.
2" Type "L" copper tubing	\$ _____ per lin. ft.
Ball Valve, under 1"	\$ _____ per unit
Ball Valve, 1"	\$ _____ per unit
Ball Valve, 1-1/2"	\$ _____ per unit
Ball Valve, 2"	\$ _____ per unit
Balancing Valve, 1/2"	\$ _____ per unit
Balancing Valve, 3/4"	\$ _____ per unit
1-1/2" cast iron pipe above grade	\$ _____ per lin. ft.
2" cast iron pipe above grade	\$ _____ per lin. ft.
2-1/2" cast iron pipe above grade	\$ _____ per lin. ft.
3" cast iron pipe above grade	\$ _____ per lin. ft.
1-1/2" copper DWV tube	\$ _____ per lin. ft.
2" service weight cast iron pipe above floor	\$ _____ per lin. ft.

Submitted by: _____
(Firm Name)

3" service weight cast iron pipe above floor \$_____ per lin. ft.

4" service weight cast iron pipe above floor \$_____ per lin. ft.

UNIT PRICES - HEATING AND VENTILATING: Materials in Place.

Galvanized steel ductwork, no liner \$_____ per lb.

Galvanized steel ductwork, including liner \$_____ per lb.

Rigid duct insulation \$_____ per sq. ft.

3/4" heating hot water piping \$_____ per lin. ft.

1" heating hot water piping \$_____ per lin. ft.

1-1/4" heating hot water piping \$_____ per lin. ft.

1-1/2" heating hot water piping \$_____ per lin. ft.

2" heating hot water piping \$_____ per lin. ft.

3/4" heating hot water piping with insulation \$_____ per lin. ft.

1" heating hot water piping with insulation \$_____ per lin. ft.

1-1/4" heating hot water piping with insulation \$_____ per lin. ft.

1-1/2" heating hot water piping with insulation \$_____ per lin. ft.

2" heating hot water piping with insulation \$_____ per lin. ft.

3/4" chilled water piping with insulation \$_____ per lin. ft.

1" chilled water piping with insulation \$_____ per lin. ft.

1-1/4" chilled water piping with insulation \$_____ per lin. ft.

1-1/2" chilled water piping with insulation \$_____ per lin. ft.

2" chilled water piping with insulation \$_____ per lin. ft.

3/4" chilled water piping \$_____ per lin. ft.

1" chilled water piping \$_____ per lin. ft.

1-1/4" chilled water piping \$_____ per lin. ft.

1-1/2" chilled water piping \$_____ per lin. ft.

2" chilled water piping \$_____ per lin. ft.

Ball Valve (Hydronic), under 1" \$_____ per unit

Ball Valve (Hydronic), 1" \$_____ per unit

Ball Valve (Hydronic), 1-1/4" \$_____ per unit

Ball Valve (Hydronic), 1-1/2" \$_____ per unit

Submitted by: _____
(Firm Name)

Ball Valve (Hydronic), 2"	\$ _____ per unit
Balancing Valve, 3/4"	\$ _____ per unit
Balancing Valve, 1"	\$ _____ per unit
Balancing Valve, 1-1/4"	\$ _____ per unit
Balancing Valve, 1-1/2"	\$ _____ per unit
3/4" three way control valve with actuator	\$ _____ per unit
1" three way control valve with actuator	\$ _____ per unit
1-1/2" three way control valve with actuator	\$ _____ per unit
2" three way control valve with actuator	\$ _____ per unit

UNIT PRICES - ELECTRICAL WORK: Materials in Place.

Power outlet (duplex or quadraplex), including outlet boxes and wiring. Receptacles will generally be connected within 10' of adjacent receptacle circuits	\$ _____ per unit
Single Channel Surface Raceway	\$ _____ per lin. ft.
Exterior weatherproof duplex power receptacle including up to 100 feet of (2)#12, (1)#12G, in 3/4" conduit	\$ _____ per unit
Ceiling mounted occupancy sensor, including wiring	\$ _____ per unit
Photosensor (daylight harvesting sensor), including wiring.	\$ _____ per unit
Fire Alarm System - Fire Alarm Pull Device, including outlet box and wiring	\$ _____ per unit
Fire Alarm System - Smoke Detector Device, including outlet box and wiring	\$ _____ per unit
Fire Alarm system wiring	\$ _____ per lin. ft.
Fire Alarm system programming	\$ _____ per Fire Alarm point
Interior cat-6 cable	\$ _____ per lin. ft.
Dual jack data outlet and 150 ft. of cable from IDF/data cabinet	\$ _____ per unit
Twenty (20) lin. ft. of Category 6 Twisted Pair Cable	\$ _____ per unit

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Submitted by: _____
(Firm Name)

3. Bidder hereby acknowledges receipt of the following Addenda:

No Addenda Issued

Addendum No. __,	issued _____	received _____ (initial)
Addendum No. __,	issued _____	received _____ (initial)
Addendum No. __,	issued _____	received _____ (initial)
Addendum No. __,	issued _____	received _____ (initial)

4. In submitting this bid, it is understood that the right is reserved by the Board of Education to accept or to reject any or all bids, and it is agreed that this bid may not be withdrawn for a period of sixty (60) days from the date set of the opening thereof.

5. Bid Security in the sum of _____ (\$ _____) in the form of _____ (Certified Check, Cashier's Check, or Bid Bond) is submitted herewith in accordance with the requirements of the specifications.

6. The undersigned is an individual ()
a partnership ()
a corporation () under the laws of the State of _____,

having principal office in the _____ of _____, County of _____, and State of _____.

Respectfully Submitted,

(Company Name, if Bidder is a company)

BIDDER'S SIGNATURE

(Company Officer, if Bidder is a Corporation or LLC)

(Seal, if Corporation)

Printed or Typed Name Title of Officer (if the Bidder is a Company)

Address

City, State, Zip Code

Dated

Phone & Fax

Email Address

NOTE: SEE BIDDERS CHECKLIST

Submitted by: _____
(Firm Name)

BIDDER'S CHECKLIST

The following checklist must be signed and submitted with the bid package to the owner as part of the bid documents. Failure to submit documents marked (*) mandatory shall be automatic cause for rejection of the bid. Items that are not marked (*) mandatory are encouraged to submit with bid but must be provided prior to the contract award.

	<u>ITEM</u>	✓
	Reviewed the Contract Documents (Including the Permits Obtained by the Board), Work Site, Locality, and All Local Conditions and Laws and Regulations That in Any Manner May Affect Cost, Progress, Performance or Furnishing of Work	
	Reviewed General Bond Requirements	
	Reviewed Agreement (Owner/contractor)	
(*)	Bidder's Proposal	
(*)	Bid Bond, Certified Check, Cashier's Check or Any Combination Thereof in an Amount of Ten Percent (10%) of the Total Amount of Bid, Not to Exceed \$20,000 (Twenty Thousand Dollars) with Power of Attorney	
(*)	Consent of Surety for 100% of the Contract Amount with Power of Attorney to Provide Performance Bond and Labor and Material Payment Bond	
(*)	Subcontractor Identification Statement	
(*)	Ownership Disclosure Certification	
(*)	Non Collusion Affidavit	
(*)	Certification of No Material Change of Circumstances - All Contractor(s)	
	Current New Jersey Department of Labor and Workforce Development Public Works Contractors Registration Act Certificate (N.J.S.A. 34:11-56.48) All Contractor(s) and Named Subcontractor(s) Encouraged to Submit with Bid but Required Prior to Contract Award	
	Business Registration Certificate - All Contractor(s) and Subcontractor(s) Encouraged to Submit with Bid but Required Prior to Contract Award	
	Division of Property Management & Construction (DPMC) Form 701 - Total Amount of Uncompleted Contracts, N.J.S.A. 34:11-56.48 et Seq. - All Contractor(s) and Subcontractor(s)	
(*)	Division of Property Management & Construction (DPMC) Current Notice of Classification - All Contractor(s) and Subcontractor(s)	
(*)	Equipment Certification	
(*)	Sworn Contractor Certification; Qualifications and Credentials (Contractor and Subcontractors)	
	Disclosure of Activities in Iran (Contractor and Subcontractors) Encouraged to Submit with Bid but Required Prior to Contract Award	

BIDDER'S CHECKLIST

	Federal and State Non-debarment Certifications - All Contractor(s) and Subcontractor(s) Encouraged to Submit with Bid but Required Prior to Contract Award	
	Certification of non Debarment for Federal Government Projects Shall Be Submitted Prior to Award of Contract - All Contractors Encouraged to Submit with Bid but Required Prior to Contract Award	
	Status of Present Contracts	
	Trade License - All Contractor(s) and Subcontractor(s)	
	HVACR Master License (HVACR Contractors)	
	Certification of Insurance Statement	
	Performance Record Certification	
	Compliance with New Jersey Prevailing Wage Act	
	Lowest Responsible Bidder by 10% or More Certification of Prevailing Wage Rates and Acknowledgment of Penalties Form	
	Political Contribution Disclosure Form	
	Contractors shall participate in an "apprenticeship training program" and shall submit evidence of same and/or a description of the contractor's apprenticeship training program prior to the award of the contract.	

By signing below, I acknowledge having read and fully understand all the requirements of each of the documents referenced herein.

BIDDER (Signature)

Dated: _____

BIDDER (Print Name)

BID BOND

THE UNDERSIGNED BIDDER and "**Surety**", a corporation duly authorized to transact business in the State of New Jersey, are held and firmly bound unto _____ (the "**OWNER**") for the full and just sum of:

_____ Dollars (\$ _____),
(10% of the Bid Price not to exceed \$20,000.00: words) **(figures)**

The payment of which sum the **BIDDER** has submitted a Bid to perform certain Work described in Bidding Documents entitled:

TITLE: _____

CONTRACT NO.: _____

The **Surety** hereby agrees to pay the full face value of this Bond to the **OWNER**, as Liquidated Damages, and not as a penalty, unless this Bond is void.

This Bond shall only be void if the **BIDDER** well, truly and faithfully performs all requirements contained in the Bidding/Contract Documents incident to an Award of the Contract including, but not limited to, proper execution and submission of the Contract Forms and all other required documentation.

On this _____ day of _____ 20____, the **BIDDER** and **Surety** hereby bind themselves herein:

FOR THE BIDDER:

FOR THE SURETY:

(Name of **BIDDER**)

(Name of **Surety**)

By: _____
(Print Name-**BIDDER's** Authorized Representative)

By: _____
(Print Name of Attorney-in-Fact)

By: _____
(Signature-**BIDDER's** Authorized Representative)

By: _____
(Signature of Attorney-in-Fact)

IMPORTANT – ATTACH AND SUBMIT WITH THE BID:

- **A POWER OF ATTORNEY FOR THE ATTORNEY-IN-FACT WHICH IS CURRENTLY DATED AND VALID FOR THE ENTIRE AMOUNT OF THE BOND**

FORM OF CONSENT OF SURETY

PERFORMANCE BOND, PAYMENT BOND and MAINTENANCE BOND

For and in consideration of the sum of one dollar (\$1.00) lawful money of the United States, the receipt is hereby acknowledged, paid to the undersigned surety, and for other valuable consideration, the undersigned surety, authorized to transact business in the State of _____, certifies and agrees that if the Contract entitled: _____

CONTRACT _____,
(NUMBER) (TITLE)

is awarded to: _____
(BIDDER'S NAME)

the undersigned hereby warrants that it is in all respects qualified to provide the required Bonds as set forth in the Contract Documents, and that it will provide and execute the **Performance Bond** in the full amount of awarded contract in the event that said contractor is awarded a contract for the above project, the **Payment Bond**, and the **Maintenance Bond** in the form and as otherwise required by the Contract Documents.

(Print Name of Surety)

(Print Name of Attorney-in-Fact)

(Signature of Attorney-in-Fact)

ATTACH AND SUBMIT WITH THE BID: A POWER OF ATTORNEY FOR THE ATTORNEY -IN-FACT WHICH IS CURRENTLY DATED AND VALID FOR THE TOTAL AMOUNT OF ALL BONDS.

Consent of Surety must be signed by an authorized agent or representative of a surety company and not by the individual or company representative submitting the bid.

NOTE: IF SUBCONTRACTORS ARE LISTED ON BID FORM, N.J.S.A. 18A:18A-18 REQUIRES THAT EVIDENCE OF PERFORMANCE SECURITY AS TO SUBCONTRACTORS BE SUBMITTED WITH THE BID, EITHER BE THE BIDDER ON ITS OWN BEHALF AND ON BEHALF OF ALL LISTED SUBCONTRACTORS, OR BY EACH SUBCONTRACTOR, OR ANY COMBINATION THEREOF, PROVIDED THAT THE PERFORMANCE SECURITY IN TOTAL EQUALS, BUT DOES NOT EXCEED, THE TOTAL AMOUNT OF THE BID.

SUBCONTRACTOR IDENTIFICATION STATEMENT

The following information is to be provided in the case of all subcontractors who will furnish labor of the various trades governed by N.J.S.A. 18A:18A-18 (b) (General Construction, Steel, Plumbing, HVAC, Electric) and all DPMC Specialty Trades, where applicable.

TRADE	Contractor's Name/Address/Telephone	NJ License No.

If work of the types designated by the above referenced law will be performed by the Bidder, the Bidder shall state below and shall enclose copies of licenses covering each trade.

TRADE	N.J. License No.

BIDDER _____

STATEMENT OF OWNERSHIP DISCLOSURE

N.J.S.A. 52:25-24.2 (P.L. 1977, c.33, as amended by P.L. 2016, c.43)

This statement shall be completed, certified to, and included with all bid and proposal submissions. Failure to submit the required information is cause for automatic rejection of the bid or proposal.

Name of Organization: _____

Organization Address: _____

City, State, ZIP: _____

Part I Check the box that represents the type of business organization:

- Sole Proprietorship
- Non-Profit Corporation (skip Parts II and III, execute certification in Part IV)
- For-Profit Corporation (any type) Limited Liability Company (LLC)
- Partnership Limited Partnership Limited Liability Partnership (LLP)
- Other (be specific): _____

Part II Check the appropriate box

- The list below contains the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be. **(COMPLETE THE LIST BELOW IN THIS SECTION)**
- OR**
- No one stockholder in the corporation owns 10 percent or more of its stock, of any class, or no individual partner in the partnership owns a 10 percent or greater interest therein, or no member in the limited liability company owns a 10 percent or greater interest therein, as the case may be. **(SKIP TO PART IV)**

(Please attach additional sheets if more space is needed):

Name of Individual or Business Entity	Address (for Individuals) or Business Address

Part III DISCLOSURE OF 10% OR GREATER OWNERSHIP IN THE STOCKHOLDERS, PARTNERS OR LLC MEMBERS LISTED IN PART II

If a bidder has a direct or indirect parent entity which is publicly traded, and any person holds a 10 percent or greater beneficial interest in the publicly traded parent entity as of the last annual federal Security and Exchange Commission (SEC) or foreign equivalent filing, ownership disclosure can be met by providing links to the website(s) containing the last annual filing(s) with the federal Securities and Exchange Commission (or foreign equivalent) that contain the name and address of each person holding a 10% or greater beneficial interest in the publicly traded parent entity, along with the relevant page numbers of the filing(s) that contain the information on each such person. **Attach additional sheets if more space is needed.**

Website (URL) containing the last annual SEC (or foreign equivalent) filing	Page #'s

Please list the names and addresses of each stockholder, partner or member owning a 10 percent or greater interest in any corresponding corporation, partnership and/or limited liability company (LLC) listed in Part II **other than for any publicly traded parent entities referenced above.** The disclosure shall be continued until names and addresses of every non-corporate stockholder, and individual partner, and member exceeding the 10 percent ownership criteria established pursuant to N.J.S.A. 52:25-24.2 has been listed. **Attach additional sheets if more space is needed.**

Stockholder/Partner/Member and Corresponding Entity Listed in Part II	Address (for Individuals) or Business Address

Part IV Certification

I, being duly sworn upon my oath, hereby represent that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I acknowledge: that I am authorized to execute this certification on behalf of the bidder/proposer; that the _____ (**Owner**) is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the completion of any contracts with the **Owner** to notify the **Owner** in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the, permitting the **Owner** to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):		Title:	
Signature:		Date:	

This statement shall be completed, certified to, and included with all bid and proposal submissions. Failure to submit the required information is cause for automatic rejection of the bid or proposal.

PERFORMANCE RECORD

How many years has your organization been in business as a Contractor under your present business name? _____

How many years experience in construction work has your organization had:

(a) As a Prime contractor? _____ (b) As a subcontractor? _____

What is the construction experience of the principal individuals of your organization?

Individual's Name	Present Position or Office	Years of Constr. Experience	Magnitude and Type of Work	In What Capacity

Have you ever failed to complete any work contracted to you? _____

If so, where and why? _____

Has any officer or partner of your organization ever failed to complete a construction contract handled in its own name?

If so, state name of individual, name of owner, location and type of project and reason for the failure to complete.

PERFORMANCE RECORD (Continued)

List of all contracts completed by you.

Name of Owner	Name & Location of Project/ Type of Work	Prime or Sub- Contractor	Architect or Engineer in Charge for Owner	Contract Price (Omit Cost)	Date Completed	Was* Time Extension Necessary	Were any Penalties Imposed	Were* Liens Claims or Stop Notice Filed

*Explain "Yes" answers.

PERFORMANCE RECORD
CERTIFICATION

Explanation of details in connection with non-completion of contracts, time extensions, penalties imposed, labor troubles experience, liens, termination of contracts, poor performance, debarment, claims and notices filed against contracts.

The information above is true and complete to the best of my knowledge and belief.

(Name of Organization)

(Signature)

(Title)

STATE OF)
)ss.
COUNTY OF)

_____, being duly sworn to law, deposes and says that it is authorized to make this affidavit for, and on behalf of, the individual, partnership or corporation herein first named as the Bidder, that deponent is familiar with the books of the said Bidder and that the foregoing statement is a true and accurate statement taken from the books of said Bidder of such financial condition as of the date herein first named; that the answers to the foregoing interrogatories are true and correct.

Subscribed and sworn to before me

This _____ day of _____, 20 ____.

(Signature)

(Seal) Notary Public of New Jersey/
Specify Other State
My Commission Expires _____, 20 ____.

Compliance with New Jersey Prevailing Wage Act (N.J.S.A. 34:11-56.25 et seq.)

Every contractor and subcontractor performing services in connection with this project, shall pay all workers a wage rate not less than the published prevailing wage rates, for the locality the work is being performed, as designated by the New Jersey Department of Labor and Workforce Development (NJ DLWD).

Wage rates for the county of the location of the Public Agency (Owner), as published by the State Department of Labor and Workforce Development (DLWD), can be viewed at https://www.nj.gov/labor/wagehour/wagerate/prevailing_wage_determinations.html

The contractor must complete and sign the "Prevailing Wage Certification" form included in the bid package and submit with his bid. This form confirms the contractor's intention to comply with the act. The Owner may terminate the contract if contractor fails to pay workers prevailing wage.

The prevailing wage rates in affect at the time of award, will be included as a part of the construction contract.

PREVAILING WAGES COMPLIANCE CERTIFICATION

It is the determination that this is a public works project that in total will exceed \$2,000.00 (two thousand dollars), therefore prevailing wages rules and regulations apply as promulgated by the New Jersey Prevailing Wage Act and in conformance with N.J.S.A. 34:11-56:25 et seq.

Certification

1. I certify that our company understands that this project requires prevailing wages to be paid in full accordance with the law.

2. I further certify that all subcontractors named in this bid understand that this project requires the subcontractor to pay prevailing wages in full accordance with the law.

Non-compliance Statement

If it is found that any worker, employed by the contractor or any subcontractor covered by said contract, has been paid a rate of wages less than the prevailing wage required to be paid by such contract, the Owner, may begin proceedings to terminate the contractor's or subcontractor's right to proceed with the work, or such part of the work as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The contractor and his sureties shall be liable for any excess costs occasioned thereby to the public body.

NOTIFICATION OF VIOLATIONS – New Jersey Department of Labor and Workforce Development

Has the bidder or any person having an “interest” with the bidder, been notified by the New Jersey Department of Labor and Workforce Development by notice issued pursuant to N.J.S.A. 34:11-56a et seq that he/she has been in violation for failure to pay prevailing wages as required by the New Jersey Prevailing Wage Act within the last five (5) years?

*Yes _____

No _____

*If yes, please attach a signed document explaining any/or all administrative proceedings with the Department within the last five (5) years. Please include any pending administrative proceedings with the Department if any.

Submission of Certified Payroll Records

All certified payroll records are to be submitted to the Owner, Business Administrator, who is coordinating the activities for the project:

Name of Company _____

Authorized Agent _____

Authorized Signature _____

**Lowest Responsible Bidder by 10% or More
Certification of Prevailing Wage Rates and
Acknowledgement of Penalties Form
P.L.2021, c.301**

I, _____ of the bidding organization/firm of _____, located in the Municipality of _____, County of _____, State of _____; and being of full age, do hereby certify and affirm that:

I am a Bidder and/or authorized representative of same submitting a bid for labor/materials/services on the _____ [Project]. I hereby certify that, should _____ [organization/firm] be deemed the lowest responsible bidder for the Project, and should _____ [organization/firm's] bid amount be ten percent (10%) or more lower than the next lowest bid for the contract, that the prevailing wage rates required by the New Jersey Prevailing Wage Act, P.L.1963, c.150 (C.34:11-56.25 et seq.) shall be paid.

Furthermore, I hereby certify and acknowledge, that I understand that if _____ [organization/firm] does not provide this Certification prior to the award of contract, the Project Owner shall award the contract to the next lowest responsible and responsive bid, pursuant to P.L.2021, c.301.

Name of Authorized Agent _____
Signature _____
Title _____
Date _____

NON-COLLUSION AFFIDAVIT

STATE OF NEW JERSEY/ _____
(Specify, if Other)

COUNTY OF _____

I, _____, of the (City, Town, Borough) of _____ State of _____, of full age, being duly sworn according to law on my oath depose and say that:

I am _____ of the firm of _____, the Bidder making the Proposal for the above named Projects, and that I executed the said Proposal with full authority to do so; that said Bidder has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named Project; and that all statements contained in said Proposal and in this affidavit are true and correct, and made with full knowledge, and the State of New Jersey relies upon the truth of the statements contained in this affidavit in awarding the contract for the said Project.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide employees or bona fide established commercial or selling agencies maintained by _____. (Name of Contractor)

(N.J.S.A. 52:34-15)

By: _____
(Signature of Authorized Representative)

Subscribed and sworn to before me
this _____ day of _____, 20____.

(Seal) Notary Public of New Jersey/

Specify Other State

My Commission Expires _____, 20 ____.

THIS FORM MUST BE COMPLETED, SIGNED, NOTARIZED, AND SUBMITTED WITH BID

CERTIFICATION OF NO MATERIAL CHANGE OF CIRCUMSTANCES

Bidder's Name: _____

Address: _____

1. A statement as to the financial ability, adequacy of plant equipment, organization and prior experience of the Bidder, as required by N.J.S.A. 18A:18A-28 has been submitted to the Department of Treasury within the last twelve (12) months preceding the date of opening of bids for this contract.

2. I certify, as required by N.J.S.A. 18A:18A-32, that there has been no material adverse change in the qualification except:

(Name and Title of Signer - Please print or type)

(Signature)

(Date)

STATUS OF PRESENT CONTRACTS

PURSUANT TO N.J.A.C. 17:19-2.13, BIDDER DECLARES THE FOLLOWING WITH RESPECT TO ITS UNCOMPLETED CONTRACTS, ON ALL WORK, FROM WHATEVER SOURCE (PUBLIC AND PRIVATE), BOTH IN NEW JERSEY AND FROM OTHER GOVERNMENTAL JURISDICTIONS.

- Each classified bidder's aggregate rating shall be calculated in accordance with formula prescribed by N.J.A.C. 17:19-2.8.
- Calculations shall be based on Bidder's base bid amount only at time of bid or total amount of base bid and accepted Alternate Bids at time of Award.

Entity	Project Title	Original Contract Amount	Uncompleted Amount As of Bid Opening Date	Name and Telephone Number of Party To Be Contacted From Entity For Verification

Sworn and Subscribed to before me
 this _____ day of _____, 20____

BIDDER

Notary Public _____

(Print and Signature)

C. 271 POLITICAL CONTRIBUTION DISCLOSURE FORM

Contractor Instructions

Business entities (contractors) receiving contracts from a public agency that are NOT awarded pursuant to a “fair and open” process (defined at N.J.S.A. 19:44A-20.7) are subject to the provisions of P.L. 2005, c. 271, s.2 (N.J.S.A. 19:44A-20.26). This law provides that 10 days prior to the award of such a contract, the contractor shall disclose contributions to:

- any State, county, or municipal committee of a political party
- any legislative leadership committee*
- any continuing political committee (a.k.a., political action committee)
- any candidate committee of a candidate for, or holder of, an elective office:
 - of the public entity awarding the contract
 - of that county in which that public entity is located
 - of another public entity within that county
 - or of a legislative district in which that public entity is located or, when the public entity is a county, of any legislative district which includes all or part of the county

The disclosure must list reportable contributions to any of the committees that exceed \$300 per election cycle that were made during the 12 months prior to award of the contract. See N.J.S.A. 19:44A-8 and 19:44A-16 for more details on reportable contributions.

N.J.S.A. 19:44A-20.26 itemizes the parties from whom contributions must be disclosed when a business entity is not a natural person. This includes the following:

- individuals with an “interest” ownership or control of more than 10% of the profits or assets of a business entity or 10% of the stock in the case of a business entity that is a corporation for profit
- all principals, partners, officers, or directors of the business entity or their spouses
- any subsidiaries directly or indirectly controlled by the business entity
- IRS Code Section 527 New Jersey based organizations, directly or indirectly controlled by the business entity and filing as continuing political committees, (PACs).

When the business entity is a natural person, “a contribution by that person’s spouse or child, residing therewith, shall be deemed to be a contribution by the business entity.” [N.J.S.A. 19:44A-20.26(b)] The contributor must be listed on the disclosure.

Any business entity that fails to comply with the disclosure provisions shall be subject to a fine imposed by ELEC in an amount to be determined by the Commission which may be based upon the amount that the business entity failed to report.

The enclosed list of agencies is provided to assist the contractor in identifying those public agencies whose elected official and/or candidate campaign committees are affected by the disclosure requirement. It is the contractor’s responsibility to identify the specific committees to which contributions may have been made and need to be disclosed. The disclosed information may exceed the minimum requirement.

The enclosed form, a content-consistent facsimile, or an electronic data file containing the required details (along with a signed cover sheet) may be used as the contractor’s submission and is disclosable to the public under the Open Public Records Act.

The contractor must also complete the attached Stockholder Disclosure Certification. This will assist the agency in meeting its obligations under the law. **NOTE: This section does not apply to Board of Education contracts.**

* N.J.S.A. 19:44A-3(s): “The term “legislative leadership committee” means a committee established, authorized to be established, or designated by the President of the Senate, the Minority Leader of the Senate, the Speaker of the General Assembly or the Minority Leader of the General Assembly pursuant to section 16 of P.L.1993, c.65 (C.19:44A-10.1) for the purpose of receiving contributions and making expenditures.”

C. 271 POLITICAL CONTRIBUTION DISCLOSURE FORM

Required Pursuant To N.J.S.A. 19:44A-20.26

**This form or its permitted facsimile must be submitted to the local unit
no later than 10 days prior to the award of the contract.**

Part I – Vendor Information

Vendor Name:			
Address:			
City:		State:	Zip:

The undersigned being authorized to certify, hereby certifies that the submission provided herein represents compliance with the provisions of N.J.S.A. 19:44A-20.26 and as represented by the Instructions accompanying this form.

Signature

Printed Name

Title

Part II – Contribution Disclosure

Disclosure requirement: Pursuant to N.J.S.A. 19:44A-20.26 this disclosure must include all reportable political contributions (more than \$300 per election cycle) over the 12 months prior to submission to the committees of the government entities listed on the form provided by the local unit.

Check here if disclosure is provided in electronic form.

Contributor Name	Recipient Name	Date	Dollar Amount
			\$

Check here if the information is continued on subsequent page(s)

STATE OF NEW JERSEY -- DIVISION OF PURCHASE AND PROPERTY
DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN

Quote Number: _____

Bidder/Offeror: _____

PART 1: CERTIFICATION

BIDDERS MUST COMPLETE PART 1 BY CHECKING EITHER BOX.

FAILURE TO CHECK ONE OF THE BOXES WILL RENDER THE PROPOSAL NON-RESPONSIVE.

Pursuant to Public Law 2012, c. 25, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must complete the certification below to attest, under penalty of perjury, that neither the person or entity, nor any of its parents, subsidiaries, or affiliates, is identified on the Department of Treasury's Chapter 25 list as a person or entity engaging in investment activities in Iran. The Chapter 25 list is found on the Division's website at <http://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf>. Bidders **must** review this list prior to completing the below certification. **Failure to complete the certification will render a bidder's proposal non-responsive.** If the Director finds a person or entity to be in violation of law, s/he shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party

PLEASE CHECK THE APPROPRIATE BOX:

I certify, pursuant to Public Law 2012, c. 25, that neither the bidder listed above nor any of the bidder's parents, subsidiaries, or affiliates is listed on the N.J. Department of the Treasury's list of entities determined to be engaged in prohibited activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25 List"). I further certify that I am the person listed above, or I am an officer or representative of the entity listed above and am authorized to make this certification on its behalf. **I will skip Part 2 and sign and complete the Certification below.**

OR

I am unable to certify as above because the bidder and/or one or more of its parents, subsidiaries, or affiliates is listed on the Department's Chapter 25 list. I will provide a detailed, accurate and precise description of the activities in Part 2 below and sign and complete the Certification below. Failure to provide such will result in the proposal being rendered as non-responsive and appropriate penalties, fines and/or sanctions will be assessed as provided by law.

PART 2: PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN

You must provide a detailed, accurate and precise description of the activities of the bidding person/entity, or one of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran outlined above by completing the boxes below.

EACH BOX WILL PROMPT YOU TO PROVIDE INFORMATION RELATIVE TO THE ABOVE QUESTIONS. PLEASE PROVIDE THOROUGH ANSWERS TO EACH QUESTION. IF YOU NEED TO MAKE ADDITIONAL ENTRIES, CLICK THE "ADD AN ADDITIONAL ACTIVITIES ENTRY" BUTTON.

Name _____	Relationship to Bidder/Offeror _____
Description of Activities _____ _____	
Duration of Engagement _____	Anticipated Cessation Date _____
Bidder/Offeror Contact Name _____	Contact Phone Number _____

Delete

ADD AN ADDITIONAL ACTIVITIES ENTRY

Certification: I, being duly sworn upon my oath, hereby represent that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I acknowledge: that I am authorized to execute this certification on behalf of the bidder; that the State of New Jersey is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the completion of any contracts with the State to notify the State in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the State, permitting the State to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print): _____

Signature: _____

Do Not Enter PIN as a Signature

Title: _____

Date: _____

EQUIPMENT CERTIFICATION

Title of Bid: _____

Bid No. _____

Bid Date: _____
(Weekday, Month 00, 20__)

In accordance with N.J.S.A. 18A:18A-23, I hereby certify that

A) _____ (Name of Company) owns all the necessary equipment as required by the specifications and to complete the specified public work project.

or

B) _____ (Name of Company) leases or controls all the necessary equipment as required by the specifications and to complete the specified public work project.

PLEASE NOTE: If your company is not the actual owner of the equipment, **you shall submit with the bid**

1. A certificate stating the source from which the equipment will be obtained and
2. Obtain and submit with the bid a certificate from the owner and person in control of the equipment, definitely granting to the bidder the control of the equipment required during such time it may be necessary for the completion of that portion of the contract for which said equipment will be necessary.

Name of Company _____

Authorized Agent _____ Title _____

Authorized Signature _____

Sworn Contractor Certification; Qualifications and Credentials

Pursuant to N.J.S.A. 18A:7G-37, a pre-qualified contractor seeking to bid school facilities projects, and any subcontractors, that are required to be named under N.J.S.A. 18A:7G-1 et seq. shall, as a condition of bidding, submit this Sworn Contractor Certification regarding qualifications and credentials.

I, _____, the principal owner or officer of the Bidder (or, the "Company"), certify that the forging statements are true and the firm has the following qualifications and credentials:

1. A current, valid certificate of registration issued pursuant to "The Public Works Contractor Registration Act," N.J.S.A. 34:11-56:48 et seq., a copy of which is submitted with this bid;
2. If a corporation or LLC formed under the laws of a state other than New Jersey, a current, valid "Certificate of Authority to perform work in New Jersey", a copy of which is submitted with this bid;
3. A current, valid, contractor or trade license required under applicable New Jersey Law for any specialty trade or specialty area in which the firm seeks to perform work, a copy of which is submitted with this bid;

I further certify that, during the term of the school facilities project, the Company will have in place a suitable quality control and quality assurance program and an appropriate safety and health plan.

I further certify that, at the time of bidding, the amount of the bid proposal and value of all of its outstanding incomplete contracts does not exceed the Company's existing aggregate rating limit.

Name of Company _____

Name of Owner or Officer _____

Signature of Owner or Officer _____

Notarized before me this _____ day of _____, _____ Year
Month

NOTARY PUBLIC SIGNATURE

Print Name of Notary Public

My commission expires _____, _____ Year
Month Day

-SEAL-

To be completed, signed, notarized and returned with bid.

CERTIFICATION OF INSURANCE STATEMENT

The Bidder fully understands the Owner's insurance requirements as stated in the Supplementary Conditions and agrees to provide all insurance required by these documents at award of contract.

COMPANY NAME

BIDDER (Signature)

BIDDER (Print Name)

Note: Failure to sign this document may result in the rejection of your Proposal.

CERTIFICATION OF INSURANCE STATEMENT

FEDERAL AND STATE NON-DEBARMENT CERTIFICATIONS

I, _____ of the city of _____, in the County of _____ and the State of _____, of full age, certify that the entity listed on the form and/or any person or company employed by this entity, are not presently on the following:

- New Jersey Department of Treasury – Consolidated Debarment Report
- New Jersey Department of Labor – Prevailing Wage Debarment List
- Federal Debarred Vendor List – System for Award Management (SAM.gov)

Company Name: _____

Authorized Agent: _____

Signature: _____

Date: _____

SECTION 004541 – CERTIFICATION OF NON-DEPARTMENT FOR
 FEDERAL GOVERNMENT CONTRACTS
 N.J.S.A. 52:32-44.1 (P.L. 2019, c.406)

Public Works Contracts

Project No. _____ Title of Bid _____

This certification shall be completed, certified to, and submitted to the contracting unit **prior to contract award**, except for emergency contracts where submission is required prior to payment.

PART I: VENDOR INFORMATION	
Individual or Organization Name	
Address of Individual or Organization	
DUNS Code (if applicable)	
CAGE Code (if applicable)	
Check the box that represents the type of business organization:	

- Sole Proprietorship (skip Parts III and IV)
 Non-Profit Corporation (skip Parts III and IV)
 For-Profit Corporation (any type)
 Limited Liability Company (LLC)
 Partnership
 Limited Partnership
 Limited Liability Partnership (LLP)
 Other (be specific): _____

PART II – CERTIFICATION OF NON-DEBARMENT: Individual or Organization			
I hereby certify that the individual or organization listed above in Part I is not debarred by the federal government from contracting with a federal agency. I further acknowledge: that I am authorized to execute this certification on behalf of the above- named organization; that the _____ (“OWNER”) is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award by “OWNER” to notify the “OWNER” in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the “OWNER” , permitting the “OWNER” to declare any contract(s) resulting from this certification void and unenforceable.			
Full Name (Print):		Title:	
Signature:		Date:	

PART III – CERTIFICATION OF NON-DEBARMENT: Individual or Entity Owning Greater than 50 Percent of Organization

Section A (Check the Box that applies)

<input type="checkbox"/>	Below is the name and address of the stockholder in the corporation who owns more than 50 percent of its voting stock, or of the partner in the partnership who owns more than 50 percent interest therein, or of the member of the limited liability company owning more than 50 percent interest therein, as the case may be.
Name of Individual or Organization	
Home Address (for Individual) or Business Address	
OR	
<input type="checkbox"/>	No one stockholder in the corporation owns more than 50 percent of its voting stock, or no partner in the partnership owns more than 50 percent interest therein, or no member in the limited liability company owns more than 50 percent interest therein, as the case may be.

Section B (Skip if no Business entity is listed in Section A above)

<input type="checkbox"/>	Below is the name and address of the stockholder in the corporation who owns more than 50 percent of the voting stock of the organization's parent entity, or of the partner in the partnership who owns more than 50 percent interest in the organization's parent entity, or of the member of the limited liability company owning more than 50 percent interest in organization's parent entity, as the case may be.
Stockholder/Partner/Member Owning Greater Than 50 Percent of Parent Entity	
Home Address (for Individual) or Business Address	
OR	
<input type="checkbox"/>	No one stockholder in the parent entity corporation owns more than 50 percent of its voting stock, no partner in the parent entity partnership owns more than 50 percent interest therein, or no member in the parent entity limited liability company owns more than 50 percent interest therein, as the case may be.

Section C – Part III Certification

I hereby certify that no individual or organization that is debarred by the federal government from contracting with a federal agency owns greater than 50 percent of the **Organization listed above in Part I** or, if applicable, owns greater than 50 percent of a parent entity of _____ (***name of organization***). I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the (“**OWNER**”) is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award “**OWNER**” to notify the “**OWNER**” in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the “**OWNER**”, permitting the “**OWNER**” to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):		Title:	
Signature:		Date:	

Part IV – CERTIFICATION OF Non-Debarment: Contractor – Controlled Entities

Section A

<input type="checkbox"/>	Below is the name and address of the corporation(s) in which the Organization listed in Part I owns more than 50 percent of voting stock, or of the partnership(s) in which the Organization listed in Part I owns more than 50 percent interest therein, or of the limited liability company or companies in which the Organization listed above in Part I owns more than 50 percent interest therein, as the case may be.
--------------------------	--

Name of Business Entity	Business Address

Add additional sheets if necessary

OR

<input type="checkbox"/>	The Organization listed above in Part I does not own greater than 50 percent of the voting stock in any corporation and does not own greater than 50 percent interest in any partnership or any limited liability company.
--------------------------	---

Section B (skip if no business entities are listed in Section A of Part IV)	
<input type="checkbox"/>	Below are the names and addresses of any entities in which an entity listed in Part III A owns greater than 50 percent of the voting stock (corporation) or owns greater than 50 percent interest (partnership or limited liability company).
Name of Business Entity Controlled by Entity Listed in Section A of Part IV	Business Address
Add additional Sheets if necessary	
OR	
<input type="checkbox"/>	No entity listed in Part III A owns greater than 50 percent of the voting stock in any corporation or owns greater than 50 percent interest in any partnership or limited liability company.

Section C – Part IV Certification of Non-Debarment			
<p>I hereby certify that the Organization listed above in Part I does not own greater than 50 percent of any entity that that is debarred by the federal government from contracting with a federal agency and, if applicable, does not own greater than 50 percent of any entity that in turns owns greater than 50 percent of any entity debarred by the federal government from contracting with a federal agency. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the (“OWNER”) is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award by “OWNER” to notify “OWNER” in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the “OWNER”, permitting the “OWNER” to declare any contract(s) resulting from this certification void and unenforceable.</p>			
Full Name (Print):		Title:	
Signature:		Date:	

Surety Disclosure Statement and Certification
N.J.S. A. 2A:44-143

SAMPLE

SURETY DISCLOSURE STATEMENT AND CERTIFICATION

....., surety(ies) on the attached bond, hereby certifies(y) the following:

(1) The surety meets the applicable capital and surplus requirements of N.J.S.A.17:17-6 or N.J.S.A. 17:17-7 as of the surety's most current annual filing with the New Jersey Department of Insurance.

(2) The capital (where applicable) and surplus, as determined in accordance with the applicable laws of this State, of the surety(ies) participating in the issuance of the attached bond is (are) in the following amount(s) as of the calendar year ended December 31, (most recent calendar year for which capital and surplus amounts are available), which amounts have been certified as indicated by certified public accountants (indicating separately for each surety that surety's capital and surplus amounts, together with the name and address of the firm of certified public accounts that shall have certified those amounts):

.....
.....
.....

(3) (a) With respect to each surety participating in the issuance of the attached bond that has received from the United States Secretary of the Treasury a certificate of authority pursuant to 31 U.S.C. 9305, the underwriting limitation established therein and the date as of which that limitation was effective is as follows (indicating for each such surety that surety's underwriting limitation and the effective date thereof):

.....
.....
.....

(b) With respect to each surety participating in the issuance of the attached bond that has not received such a certificate of authority from the United States Secretary of the Treasury, the underwriting limitation of that surety as established pursuant to N.J.S.A. 17:18-9 as of (date on which such limitation was so established) is as follows (indicating for each such surety that surety's underwriting limitation and the date on which that limitation was established):

.....
.....
.....

(4) The amount of the bond to which this statement and certification is attached is \$.....

(5) If, by virtue of one or more contracts of reinsurance, the amount of the bond indicated under item (4) above exceeds the total underwriting limitation of all sureties on the bond as set forth in items (3)(a) or (3)(b) above, or both, then for each such contract of reinsurance:

(a) The name and address of each such reinsurer under that contract and the amount of that reinsurer's participation in the contract is as follows:.....

.....

.....

.....; and

(b) Each surety that is party to any such contract of reinsurance certifies that each reinsurer listed under item (5)(a) satisfies the credit for reinsurance requirement established under NJSA 17:51B-1 et seq. and any applicable regulations in effect as of the date on which the bond to which this statement and certification is attached shall have been filed with the appropriate public agency.

CERTIFICATE

(to be completed by an authorized certifying agent

for each surety on the bond)

I (name of agent), as (title of agent) for (name of surety), a corporation/mutual insurance company/other (indicating type of business organization) (circle one) domiciled in (state of domicile), DO HEREBY CERTIFY that, to the best of my knowledge, the foregoing statements made by me are true, and ACKNOWLEDGE that, if any of those statements are false, this bond is VOIDABLE.

.....

(Signature of certifying agent)

.....

(Printed name of certifying agent)

.....

(Title of certifying agent)

PERFORMANCE BOND

Bond No. _____

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned _____ as PRINCIPAL and sureties with underwriting office at _____ to which all communication in regard to this bond should be addressed, a Corporation organized and existing under the laws of the State of _____ and duly authorized to do business in the state of New Jersey, as SURETY, are hereby held and firmly bound unto the _____ in the penal sum of _____, for payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

SIGNED and SEALED this _____ day of _____ two thousand and _____.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT, WHEREAS, the above named Principal did on the _____ day of _____, 20____, entered into a contract with _____ identified as _____ which said contract, upon execution by the Owner, and the Principal, will be a part of this bond the same as though set forth herein.

Now, if the said Principal shall well and faithfully do and perform each and every, all and singular, the things agreed by it (or them) to be done and performed according to the terms of said contract, and shall pay all lawful claims of beneficiaries as defined by N.J.S.2A:44-143 for labor performed or materials, provisions, provender or other supplies or teams, fuels, oils, implements or machinery furnished, used or consumed in the carrying forward, performing or completing of said contract, we agreeing and assenting that this undertaking shall be for the benefit of any beneficiary as defined in N.J.S.2A:44-143 having a just claim, as well as for the oblige herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being 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.

The said Surety hereby stipulated and agrees that no modifications, omissions or additions in or to the terms of the said contract, or in or to the plans or specifications therefore, shall in anyway affect the obligations of said Surety on its bond.

Recovery of any claimant under the bond shall be subject to the conditions and provisions of this article to the same extent as if such conditions and provisions were fully incorporated in the form set forth above.

Principal:

By: _____
Print Name:
Print Title:

Affix
Corporate
Seal

Witness

Print or Type Name

Surety:

By: _____
Print Name:
Print Title:

Affix
Corporate
Seal

Witness

Print or Type Name

PAYMENT BOND

Bond No. _____

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned _____ as PRINCIPAL and sureties with underwriting office at _____ to which all communication in regard to this bond should be addressed, a Corporation organized and existing under the laws of the State of _____ and duly authorized to do business in the state of New Jersey, as SURETY, are hereby held and firmly bound unto the _____ in the penal sum of _____, for payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

SIGNED and SEALED this _____ day of _____ two thousand and _____.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT, WHEREAS, the above named Principal did on the _____ day of _____, 20____, entered into a contract with _____ identified as _____ which said contract, upon execution by the Owner, and the Principal, will be a part of this bond the same as though set forth herein.

Now, if the said Principal shall pay all lawful claims of beneficiaries as defined by N.J.S.2A:44-143 for labor performed or materials, provisions, provender or other supplies or teams, fuels, oils, implement or machinery furnished, used or consumed in carrying forward, performing or completing of said contract, we agreeing and assenting that this undertaking shall be for the benefit of any beneficiary as defined in N.J.S.2A;44-143 having a just claim, as well as for the party of the first part mentioned in the contract aforesaid; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being 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.

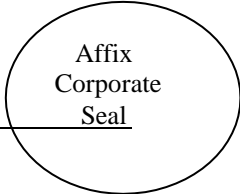
The said Surety hereby stipulated and agrees that no modifications, omissions or additions in or to the terms of the said contract, or in or to the plans or specifications therefore, shall in anyway affect the obligations of said Surety on its bond.

Principal:

By: _____

Print Name:

Print Title:



Witness

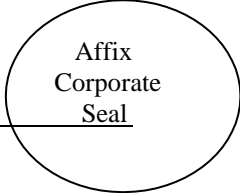
Print or Type Name

Surety:

By: _____

Print Name:

Print Title:



Witness

Print or Type Name

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS, That we, the undersigned,

as principal, and _____ a Corporation organized and existing under the laws of the state of _____, and duly authorized to do business in the State of New Jersey, as Surety, are held and firmly bound unto the _____ as Owner, in the penal sum of _____

(10% of the Final Contract Amount)

for payment of which, well and truly to be made, we hereby, jointly, and severally, bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, That whereas the above named principal did on the _____ day of _____, 20____, enter into a Contract with the Owner for _____

(Project Name)

which said Contract is made a part of this bond the same as though set forth herein.

NOW, if the said principal shall remedy without cost to the Owner any defects which may develop during the two (2) year Maintenance Period of the work performed under the said Contract, provided such defects, in the judgment of the Owner are caused by defective or inferior materials or workmanship, then this obligation shall be void, otherwise it shall be and remain in full force and effect. The two (2) year period shall commence on the date established in the Certificate of Substantial Completion.

The said Surety hereby stipulates and agrees that no modifications, deletions or additions in or to the terms of the said Contract or the plans or specifications therefor shall in any way affect its obligations on this bond.

Signed and Sealed this _____ day of _____, 20__.

(Principal) (Seal)

(Witness)

(Title)

(Surety) (Seal)

(Witness)

(Title)

STATE OF NEW JERSEY

DEPARTMENT OF LABOR & WORKFORCE DEVELOPMENT
CONSTRUCTION EEO COMPLIANCE MONITORING PROGRAM

Assignment

Code

FORM AA-201

Revised 11/11

INITIAL PROJECT WORKFORCE REPORT CONSTRUCTION

For instructions on completing the form, go to: http://www.state.nj.us/treasury/contract_compliance/pdf/aa201ins.pdf

1. FID NUMBER		2. CONTRACTOR ID NUMBER		5. NAME AND ADDRESS OF PUBLIC AGENCY AWARDING CONTRACT						
3. NAME AND ADDRESS OF PRIME CONTRACTOR				Name:						
				Address:						
(Name)				CONTRACT NUMBER		DATE OF AWARD		DOLLAR AMOUNT OF AWARD		
(Street Address)				6. NAME AND ADDRESS OF PROJECT				7. PROJECT NUMBER		
(City) (State) (Zip Code)										Name:
4. IS THIS COMPANY MINORITY OWNED [] OR WOMAN OWNED []				Address:						
				COUNTY						8. IS THIS PROJECT COVERED BY A PROJECT LABOR AGREEMENT (PLA)? YES <input type="checkbox"/>
9. TRADE OR CRAFT	PROJECTED TOTAL EMPLOYEES				PROJECTED MINORITY EMPLOYEES				PROJECTED PHASE - IN DATE	PROJECTED COMPLETION DATE
	MALE		FEMALE		MALE		FEMALE			
	J	AP	J	AP	J	AP	J	AP		
1. ASBESTOS WORKER										
2. BRICKLAYER OR MASON										
3. CARPENTER										
4. ELECTRICIAN										
5. GLAZIER										
6. HVAC MECHANIC										
7. IRONWORKER										
8. OPERATING ENGINEER										
9. PAINTER										
10. PLUMBER										
11. ROOFER										
12. SHEET METAL WORKER										
13. SPRINKLER FITTER										
14. STEAMFITTER										
15. SURVEYOR										
16. TILER										
17. TRUCK DRIVER										
18. LABORER										
19. OTHER										
20. OTHER										

I hereby certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements are willfully false, I am subject to punishment.

(Signature)

10. (Please Print Your Name)

(Title)

(Area Code)

(Telephone Number)

(Ext.)

(Date)

State Of New Jersey

Department of Labor & Workforce Development
Construction EEO Compliance Monitoring Program

MONTHLY PROJECT WORKFORCE REPORT - CONSTRUCTION

For instructions on completing the form, go to: http://www.state.nj.us/treasury/contract_compliance/pdf/aa202ins.pdf		3. F ID or SS Number	
1. Name and address of Prime Contractor (NAME)	2. Contractor ID Number	4. Reporting Period	
(ADDRESS)		5. Public Agency Awarding Contract	
(CITY) (STATE) (ZIP CODE)		6. Name and Location of Project	County
		7. Project ID Number	

8. CONTRACTOR NAME (LIST PRIME CONTRACTOR WITH SUBS FOLLOWING)	9. PERCENT OF WORK COMPLETED	10. TRADE OR CRAFT	CLASSIFICATION (SEE REVERSE)	11. NUMBER OF EMPLOYEES						12. TOTAL	13. WORK HOURS		14. % OF WORK HRS		15. CUM. WORK HRS		16. CUM. % OF W/H			
				A.	B.	C.	D.	E.	F.	NO. OF	TOTAL	A.	B.	A.	B.	TOTAL	A.	B.	A.	B.
				TOTAL	BLACK	HISPANIC	AMERICAN INDIAN	ASIAN	FEMALES	MIN. EMP.	WORK HOURS	MIN. W/H	FEMALE W/H	% OF MIN. W/H	% OF FEMALE W/H	WORK HOURS	MIN. HOURS	FEMALE HOURS	% OF MIN. W/H	% OF FEM. W/H
			J																	
			AP																	
			J																	
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			J																	
			AP																	
			J																	
			AP																	

17. COMPLETED BY (PRINT OR TYPE)

(NAME) (SIGNATURE) (TITLE)

(AREA CODE) (TELEPHONE NUMBER) (EXT.) (DATE)



AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the day of in the year
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Clearview Regional High School District
420 Cedar Road
Mullica Hill, NJ 08062-9436

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

The Architect:
(Name, legal status, address and other information)

Fraytak Veisz Hopkins Duthie, P.C.
1515 Lower Ferry Road
Trenton, NJ 08618

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

1	THE CONTRACT DOCUMENTS
2	THE WORK OF THIS CONTRACT
3	DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
4	CONTRACT SUM
5	PAYMENTS
6	DISPUTE RESOLUTION
7	TERMINATION OR SUSPENSION
8	MISCELLANEOUS PROVISIONS
9	ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9. In the event of any conflict among the Contract Documents, the Contractor shall notify the Owner and the Architect of same and follow and comply with their interpretation of same.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

- The date of this Agreement.
- A date set forth in a notice to proceed issued by the Owner/Architect.
- Established as follows:

All construction preparation work, project startup, submittals, schedules, approvals, procurement, coordination and other preparatory tasks must commence immediately upon receipt of the Notice to Proceed or the date of the fully executed Owner/Contractor Contract, whichever comes first. The Awarded Contractor must be fully prepared to deliver and install all materials and equipment on the first day of the schedule on-site Construction period. The on-site Construction period, during which all work on site is to be performed, is to start as soon as possible.

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§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

(Check one of the following boxes and complete the necessary information.)

Not later than () calendar days from the date of commencement of the Work.

Substantial Completion for each of the Milestones shall be as shown in specification section 01800

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date
-----------------	-----------------------------

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor’s performance of the Contract. The Contract Sum shall be (\$), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price
------	-------

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.

(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance
------	-------	---------------------------

§ 4.3 Allowances, if any, included in the Contract Sum:

(Identify each allowance.)

Item	Price
------	-------

§ 4.4 Unit prices, if any:

(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit (\$0.00)
------	-----------------------	-------------------------

§ 4.5 Liquidated damages, if any:

The Contractor understands and agrees that all work must be performed in an orderly and closely coordinated sequence so that the dates for Substantial Completion and Final Completion are met. TIME IS OF THE ESSENCE. If the Contractor fails to complete his/her work or fails to complete a portion of his/her work and therefore not achieve Substantial Completion and/or Final Completion on the respective dates required, he/she shall pay the Owner, as liquidated damages and not as a penalty, which is agreed upon as a reasonable and proper measure which the Owner

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User Notes:

will sustain each calendar day by failure of the Contractor to complete work with the stipulated time. Liquidated damages to be assessed per calendar day of the delay and in accordance with Specification Section 01800 - Time of Completion and liquidated Damages and as further stated in AIA A201-2017, under Section 8.2.1, Progress and Completion, By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work. For damage occurring at the time of delay, the Owner may retain the amount due to him under this clause from any payment due to the Contractor.

§ 4.6 Other:

(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the tenth day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the tenth day of the following month. All Applications for Payment, Certified Payroll Records, and Manning Reports shall include the relevant purchase order number and project number. No billings shall be deemed approved and certified by passage of time. For applications not submitted by the application date, and because the Owner's governing body must vote on authorizations for each periodic payment, final payment or retainage monies, the amount due may be approved and certified at the next month's scheduled public meeting of the entity's governing body, and paid during the entity's subsequent payment cycle. .

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- .1 That portion of the Contract Sum properly allocable to completed Work;
- .2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

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- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Two percent (2%) of the amount due on each partial payment shall be withheld when the outstanding balance of the contract exceeds \$500,000, and five percent (5%) of the amount due on each partial payment shall be withheld when the outstanding balance of the contract is \$500,000 or less.

§ 5.1.7.1.1 The following items are not subject to retainage:

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017. If there are any claims or disputes, the Contractor is to submit in accordance with Article 15 as pre-requisite to such claim. Notwithstanding the foregoing and anything construed to the contrary, the foregoing shall only be applicable in the event that: (i) the Contractor has produced an updated Schedule prior to the alleged material delay; (ii) there are no components of the project for which the contractor has delayed; and (iii) the alleged materially delayed component of the project affects the critical path and no other Work can continue to keep the project on schedule.

§ 5.1.9 Except with the Owner’s prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor’s responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner’s final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect’s final Certificate for Payment, or as follows:

30 days after the Architects final Certificate for Payment, or at the next scheduled Board of Education meeting where official action may be take, whichever is later.

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

0 % Zero

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker. *(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)*

§ 6.2 Binding Dispute Resolution

For any Claim, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

- Arbitration pursuant to Section 15.4 of AIA Document A201–2017
- Litigation in a NJ Court of Law or court of competent jurisdiction in Gloucester County, New Jersey
- Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner’s convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:

No Termination Fee

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

(Name, address, email address, and other information)

:
(Name, address, email address, and other information)

§ 8.5 Insurance and Bonds

§ 8.5.1 The Contractor shall purchase and maintain insurance as set forth in AIA Document A101™-2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™-2017 Exhibit A, and elsewhere in the Contract Documents.

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™-2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™-2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™-2017, General Conditions of the Contract for Construction

.5 Drawings

Number

Title

Date

.6 Specifications

Section

Title

Date

Pages

.7 Addenda, if any:

Number

Date

Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

AIA Document E204™-2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

The Sustainability Plan:

Title

Date

Pages

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User Notes:

(1801877321)

[] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
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- .9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™-2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*

(Printed name and title)

CONTRACTOR *(Signature)*

(Printed name and title)

AIA[®] Document A101[®] – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the day of in the year
(In words, indicate day, month and year.)

for the following **PROJECT**:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

Clearview Regional High School District
420 Cedar Road, Mullica Hill, NJ 08062

THE CONTRACTOR:
(Name, legal status and address)

TABLE OF ARTICLES

- A.1 **GENERAL**
- A.2 **OWNER'S INSURANCE**
- A.3 **CONTRACTOR'S INSURANCE AND BONDS**
- A.4 **SPECIAL TERMS AND CONDITIONS**

ARTICLE A.1 **GENERAL**

The Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction and the Project Manual.

(Paragraphs deleted)

ARTICLE A.2 Intentionally deleted.

(Paragraphs deleted)

(Table deleted)

(Paragraphs deleted)

(Table deleted)

ARTICLE A.3 **CONTRACTOR'S INSURANCE AND BONDS**

§ A.3.1 General

§ A.3.1.1 **Certificates of Insurance.** The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner and such other parties as the Owner may designate as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies. The insurance described herein shall be written by a company or companies rated "A-/VII" or better by Best Insurance Guide, licensed to do business in the State of New Jersey. Such certificates shall provide that there shall be no cancellation, non-renewal or material change or such coverage without thirty (30) days prior written notice to Owner. If the contractor fails to maintain any insurance required hereunder, then, in addition to all other remedies given to the Owner in case of the breach of any conditions or covenants of this Contract, the Owner may (but shall not be obligated to) secure or pay the premium for any such policy or policies and charge the Contractor therefor the cost of such premiums plus fifteen percent (15%) as an administrative fee to the Owner.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor. Such deductibles or self-insured retentions shall be subject to the Owner's approval. The Contractor shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor (and all Subcontractors) shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04. The Products and Completed Operations insurance shall be maintained for five (5) years after final payment or the then current applicable statute of repose. A "per project endorsement" shall be included, so that the general aggregate limit applies solely to the project that is the subject of this contract."

§ A.3.1.4 All insurance shall contain a waiver of subrogation against the Board.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than three million dollars (\$ 3,000,000.00) each occurrence, three million dollars (\$ 3,000,000.00) general aggregate, and three million dollars (\$ 3,000,000.00) aggregate for products-completed operations hazard (and independent contractor liability), providing coverage for claims including

- .1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- .2 personal injury and advertising injury;
- .3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- .4 bodily injury or property damage arising out of completed operations; and
- .5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

- .6 the policy shall name the Owner, Architect, Construction Manager (if applicable) and their Consultants, Agents and Employees as additional insured.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

- .1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
- .2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
- .3 Claims for bodily injury other than to employees of the insured.
- .4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
- .5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
- .6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
- .7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
- .8 Claims related to roofing, if the Work involves roofing.
- .9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
- .10 Claims related to earth subsidence or movement, where the Work involves such hazards.
- .11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than one million dollars (\$ 1,000,000.00) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation Insurance applicable to the laws of the State of New Jersey and other State or Federal jurisdiction required to protect the employees of the Contractor and any Subcontractor who will be engaged in the performance of this Contract. The certificate must so indicate that no proprietor, partner, executive officer or member is excluded. This insurance shall include Employers' Liability Protection with a limit of liability not less than one million dollars (\$1,000,000) disease, each employer, and one million dollars (\$1,000,000) disease, aggregate limit. Including the employer's liability insurance under the umbrella insurance can satisfy the limit requirements.

§ A.3.2.6 Employers' Liability – refer to paragraph A.3.2.5 for limits.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.2.13 Excess Liability, umbrella insurance form, applying excess of primary to the commercial general liability, commercial automobile liability and employer's liability insurance shall be provided in an amount such that the commercial general liability insurance and excess/umbrella equals the limits as set forth in Article A.3.

§ A.3.2.14 The General Liability insurance General Aggregate and Umbrella Excess Liability limits shall apply and be written exclusively, in total, to this Project only. A per project endorsement for all coverage's and limits must be included in each policy.

A.3.2.14.1 Bodily injury and property damage insurance policies shall be so written as to provide coverage for special hazards where such hazards will be incidental to subcontractors' work.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

- [] § A.3.3.2.1 Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
- (Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)*

- [] § A.3.3.2.2 Railroad Protective Liability Insurance, with policy limits of not less than (\$) per claim and (\$) in the aggregate, for Work within fifty (50) feet of railroad property.

- [] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than (\$) per claim and (\$) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.
- [] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.
- [] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.
- [] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage

Limits

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:

(Specify type and penal sum of bonds.)

Type	Penal Sum (\$0.00)
Payment Bond	Amount equal to the Contract Sum
Performance Bond	Amount equal to the Contract Sum
Maintenance Bond	10% of Final Contract Sum for two (2) years

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

§ A.3.5 Contractor shall furnish each of the performance bond and payment bond meeting all statutory requirements of the State of New Jersey in form and substance satisfactory to the Owner and, without limitation, complying with the following specific requirements:

- .1 Except as otherwise required by statute, the form and substance of such bonds shall be satisfactory to the Owner in the Owner's sole judgment.
- .2 The bonds shall be executed by an approved surety company authorized to do business in the State of New Jersey and in accordance with N.J.S.A. 2A:44-143 and 2A:44-144, and with the three highest rating categories of rating companies nationally recognized and listed as per Appendix A, (go to www.nj.gov/dobi/surety.htm), and shall remain in effect for a period of not less than one year following the date of substantial completion or the time required to resolve any items of incomplete or inadequate work and the payment of any disputed amounts, whichever time period is longer;
- .3 The performance bond and the labor and material payment bond shall each be in an amount equal to the Contract Sum;
- .4 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of his/her power of attorney indicating the monetary limit of such power;
- .5 Any bond under this Paragraph 11.6.1 must display the surety's bond number. A rider including the following provisions shall be attached to each bond:
 - .1 Surety hereby agrees that it consents to and waives notice of any addition, alteration, omission, change or other modification of the Contract Documents. Any other alterations, change, extension of time or other modification of the Contract Documents or a forbearance on the part of either the Owner or the Contractor to the other shall not release the surety of its obligations hereunder and notice to surety of such matter is hereby waived.
 - .2 Surety further agrees that in the event of any default by the Owner in the performance of the Owner's obligations to the Contractor under the Contract, the Contractor or surety shall

cause written notice of such default (specifying said default in writing) to be given to the Owner, and the Owner shall have thirty (30) calendar days after receipt of such notice within which to cure such default or such additional reasonable time as may be required if the nature of such default is such that it cannot be cured within thirty (30) calendar days. Such notice of default shall be sent by certified or registered U.S. mail, return receipt requested, first class postage, prepaid to the Owner.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

PART 1 - CONTRACT CONDITIONS AND GENERAL REQUIREMENTS

**SECTION 00700 - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION
AIA DOCUMENT A201 - 2017**



AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

THE OWNER:
(Name, and address)

Clearview Regional High School District

THE ARCHITECT:
(Name, and address)

Fraytak Veisz Hopkins Duthie, P.C. Architects - Planners
1515 Lower Ferry Road, Trenton, NJ 08618

TABLE OF ARTICLES

- 1 GENERAL PROVISIONS
- 2 OWNER
- 3 CONTRACTOR
- 4 ARCHITECT
- 5 SUBCONTRACTORS
- 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
- 7 CHANGES IN THE WORK
- 8 TIME
- 9 PAYMENTS AND COMPLETION
- 10 PROTECTION OF PERSONS AND PROPERTY
- 11 INSURANCE AND BONDS
- 12 UNCOVERING AND CORRECTION OF WORK
- 13 MISCELLANEOUS PROVISIONS
- 14 TERMINATION OR SUSPENSION OF THE CONTRACT
- 15 CLAIMS AND DISPUTES

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

Init.

INDEX

(Topics and numbers in bold are Section headings.)

Acceptance of Nonconforming Work

9.6.6, 9.9.3, 12.3

Acceptance of Work

9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3

Access to Work

3.16, 6.2.1, 12.1

Accident Prevention

10

Acts and Omissions

3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5,
10.2.8, 13.3.2, 14.1, 15.1.2, 15.2

Addenda

1.1.1

Additional Costs, Claims for

3.7.4, 3.7.5, 10.3.2, 15.1.5

Additional Inspections and Testing

9.4.2, 9.8.3, 12.2.1, 13.4

Additional Time, Claims for

3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, 15.1.6

Administration of the Contract

3.1.3, 4.2, 9.4, 9.5

Advertisement or Invitation to Bid

1.1.1

Aesthetic Effect

4.2.13

Allowances

3.8

Applications for Payment

4.2.5, 7.3.9, 9.2, 9.3, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10

Approvals

2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9,
3.12.10.1, 4.2.7, 9.3.2, 13.4.1

Arbitration

8.3.1, 15.3.2, 15.4

ARCHITECT

4

Architect, Definition of

4.1.1

Architect, Extent of Authority

2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2,
9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1,
13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1

Architect, Limitations of Authority and Responsibility

2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2,
4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4,
9.4.2, 9.5.4, 9.6.4, 15.1.4, 15.2

Architect's Additional Services and Expenses

2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4

Architect's Administration of the Contract

3.1.3, 3.7.4, 15.2, 9.4.1, 9.5

Architect's Approvals

2.5, 3.1.3, 3.5, 3.10.2, 4.2.7

Architect's Authority to Reject Work

3.5, 4.2.6, 12.1.2, 12.2.1

Architect's Copyright

1.1.7, 1.5

Architect's Decisions

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3,
7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1,
13.4.2, 15.2

Architect's Inspections

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4

Architect's Instructions

3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2

Architect's Interpretations

4.2.11, 4.2.12

Architect's Project Representative

4.2.10

Architect's Relationship with Contractor

1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2,
3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16,
3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5,
9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2

Architect's Relationship with Subcontractors

1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3

Architect's Representations

9.4.2, 9.5.1, 9.10.1

Architect's Site Visits

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4

Asbestos

10.3.1

Attorneys' Fees

3.18.1, 9.6.8, 9.10.2, 10.3.3

Award of Separate Contracts

6.1.1, 6.1.2

Award of Subcontracts and Other Contracts for Portions of the Work

5.2

Basic Definitions

1.1

Bidding Requirements

1.1.1

Binding Dispute Resolution

8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5,
15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1

Bonds, Lien

7.3.4.4, 9.6.8, 9.10.2, 9.10.3

Bonds, Performance, and Payment

7.3.4.4, 9.6.7, 9.10.3, 11.1.2, 11.1.3, 11.5

Digital Data Use and Reliance

1.8

Building Permit

3.7.1

Capitalization

1.3

Certificate of Substantial Completion

9.8.3, 9.8.4, 9.8.5

Init.

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(3B9ADA45)

Certificates for Payment
 4.2.1, 4.2.5, 4.2.9, 9.3.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7,
 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4
 Certificates of Inspection, Testing or Approval
 13.4.4
 Certificates of Insurance
 9.10.2
 Change Orders
 1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3,
 7.1.2, 7.1.3, 7.2, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1,
 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2
 Change Orders, Definition of
 7.2.1
 CHANGES IN THE WORK
 2.2.2, 3.11, 4.2.8, 7, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1,
 11.5
 Claims, Definition of
 15.1.1
 Claims, Notice of
 1.6.2, 15.1.3
 CLAIMS AND DISPUTES
 3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, 15, 15.4
 Claims and Timely Assertion of Claims
 15.4.1
 Claims for Additional Cost
 3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, 15.1.5
 Claims for Additional Time
 3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, 15.1.6
 Concealed or Unknown Conditions, Claims for
 3.7.4
 Claims for Damages
 3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3,
 11.3.2, 14.2.4, 15.1.7
 Claims Subject to Arbitration
 15.4.1
 Cleaning Up
 3.15, 6.3
 Commencement of the Work, Conditions Relating to
 2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3,
 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, 15.1.5
 Commencement of the Work, Definition of
 8.1.2
 Communications
 3.9.1, 4.2.4
 Completion, Conditions Relating to
 3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1,
 9.10, 12.2, 14.1.2, 15.1.2
 COMPLETION, PAYMENTS AND
 9
 Completion, Substantial
 3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1,
 9.10.3, 12.2, 15.1.2
 Compliance with Laws
 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2,
 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3,
 15.2.8, 15.4.2, 15.4.3
 Concealed or Unknown Conditions

3.7.4, 4.2.8, 8.3.1, 10.3
 Conditions of the Contract
 1.1.1, 6.1.1, 6.1.4
 Consent, Written
 3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2,
 15.4.4.2
 Consolidation or Joinder
 15.4.4
 CONSTRUCTION BY OWNER OR BY
 SEPARATE CONTRACTORS
 1.1.4, 6
 Construction Change Directive, Definition of
 7.3.1
 Construction Change Directives
 1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3,
 7.3, 9.3.1.1
 Construction Schedules, Contractor's
 3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
 Contingent Assignment of Subcontracts
 5.4, 14.2.2.2
 Continuing Contract Performance
 15.1.4
 Contract, Definition of
 1.1.2
 CONTRACT, TERMINATION OR SUSPENSION
 OF THE
 5.4.1.1, 5.4.2, 11.5, 14
 Contract Administration
 3.1.3, 4, 9.4, 9.5
 Contract Award and Execution, Conditions Relating
 to
 3.7.1, 3.10, 5.2, 6.1
 Contract Documents, Copies Furnished and Use of
 1.5.2, 2.3.6, 5.3
 Contract Documents, Definition of
 1.1.1
 Contract Sum
 2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4,
 9.1, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2,
 12.3, 14.2.4, 14.3.2, 15.1.4.2, 15.1.5, 15.2.5
 Contract Sum, Definition of
 9.1
 Contract Time
 1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5,
 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1,
 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2,
 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5
 Contract Time, Definition of
 8.1.1
 CONTRACTOR
 3
 Contractor, Definition of
 3.1, 6.1.2
 Contractor's Construction and Submittal Schedules
 3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2
 Contractor's Employees

2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6,
10.2, 10.3, 11.3, 14.1, 14.2.1.1
Contractor's Liability Insurance
11.1
Contractor's Relationship with Separate Contractors
and Owner's Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4
Contractor's Relationship with Subcontractors
1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2,
9.6.7, 9.10.2, 11.2, 11.3, 11.4
Contractor's Relationship with the Architect
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2,
3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2,
6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6,
10.3, 11.3, 12, 13.4, 15.1.3, 15.2.1
Contractor's Representations
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2
Contractor's Responsibility for Those Performing the
Work
3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8
Contractor's Review of Contract Documents
3.2
Contractor's Right to Stop the Work
2.2.2, 9.7
Contractor's Right to Terminate the Contract
14.1
Contractor's Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2,
9.8.3, 9.9.1, 9.10.2, 9.10.3
Contractor's Superintendent
3.9, 10.2.6
Contractor's Supervision and Construction
Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4,
7.1.3, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4
Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1
Copies Furnished of Drawings and Specifications
1.5, 2.3.6, 3.11
Copyrights
1.5, 3.17
Correction of Work
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, 12.2, 12.3,
15.1.3.1, 15.1.3.2, 15.2.1
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.4
Costs
2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3,
7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6,
11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 14
Cutting and Patching
3.14, 6.2.5
Damage to Construction of Owner or Separate
Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4

Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damages, Claims for
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2,
11.3, 14.2.4, 15.1.7
Damages for Delay
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2
Date of Commencement of the Work, Definition of
8.1.2
Date of Substantial Completion, Definition of
8.1.3
Day, Definition of
8.1.4
Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4,
7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2,
14.2.2, 14.2.4, 15.1, 15.2
Decisions to Withhold Certification
9.4.1, 9.5, 9.7, 14.1.1.3
Defective or Nonconforming Work, Acceptance,
Rejection and Correction of
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3,
9.10.4, 12.2.1
Definitions
1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1,
6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1
Delays and Extensions of Time
3.2, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, 8.3, 9.5.1, 9.7,
10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5
Digital Data Use and Transmission
1.7
Disputes
6.3, 7.3.9, 15.1, 15.2
Documents and Samples at the Site
3.11
Drawings, Definition of
1.1.5
Drawings and Specifications, Use and Ownership of
3.11
Effective Date of Insurance
8.2.2
Emergencies
10.4, 14.1.1.2, 15.1.5
Employees, Contractor's
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2,
10.3.3, 11.3, 14.1, 14.2.1.1
Equipment, Labor, or Materials
1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,
4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3,
9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1,
3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1,
9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4
Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2,
10.4, 14.3, 15.1.6, 15.2.5

Failure of Payment
 9.5.1.3, 9.7, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
 Faulty Work
 (See Defective or Nonconforming Work)
 Final Completion and Final Payment
 4.2.1, 4.2.9, 9.8.2, 9.10, 12.3, 14.2.4, 14.4.3
 Financial Arrangements, Owner's
 2.2.1, 13.2.2, 14.1.1.4
GENERAL PROVISIONS
 1
 Governing Law
 13.1
 Guarantees (See Warranty)
 Hazardous Materials and Substances
 10.2.4, 10.3
 Identification of Subcontractors and Suppliers
 5.2.1
 Indemnification
 3.17, 3.18, 9.6.8, 9.10.2, 10.3.3, 11.3
 Information and Services Required of the Owner
 2.1.2, 2.2, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5,
 9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2,
 14.1.1.4, 14.1.4, 15.1.4
 Initial Decision
 15.2
 Initial Decision Maker, Definition of
 1.1.8
 Initial Decision Maker, Decisions
 14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
 Initial Decision Maker, Extent of Authority
 14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
 Injury or Damage to Person or Property
 10.2.8, 10.4
 Inspections
 3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3,
 9.9.2, 9.10.1, 12.2.1, 13.4
 Instructions to Bidders
 1.1.1
 Instructions to the Contractor
 3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2
 Instruments of Service, Definition of
 1.1.7
 Insurance
 6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5,
 11
 Insurance, Notice of Cancellation or Expiration
 11.1.4, 11.2.3
 Insurance, Contractor's Liability
 11.1
 Insurance, Effective Date of
 8.2.2, 14.4.2
 Insurance, Owner's Liability
 11.2
 Insurance, Property
 10.2.5, 11.2, 11.4, 11.5
 Insurance, Stored Materials
 9.3.2

INSURANCE AND BONDS
 11
 Insurance Companies, Consent to Partial Occupancy
 9.9.1
 Insured loss, Adjustment and Settlement of
 11.5
 Intent of the Contract Documents
 1.2.1, 4.2.7, 4.2.12, 4.2.13
 Interest
 13.5
 Interpretation
 1.1.8, 1.2.3, 1.4, 4.1.1, 5.1, 6.1.2, 15.1.1
 Interpretations, Written
 4.2.11, 4.2.12
 Judgment on Final Award
 15.4.2
 Labor and Materials, Equipment
 1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,
 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1,
 10.2.4, 14.2.1.1, 14.2.1.2
 Labor Disputes
 8.3.1
 Laws and Regulations
 1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4,
 9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8,
 15.4
 Liens
 2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
 Limitations, Statutes of
 12.2.5, 15.1.2, 15.4.1.1
 Limitations of Liability
 3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6,
 4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3,
 11.3, 12.2.5, 13.3.1
 Limitations of Time
 2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7,
 5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3,
 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15,
 15.1.2, 15.1.3, 15.1.5
 Materials, Hazardous
 10.2.4, 10.3
 Materials, Labor, Equipment and
 1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,
 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2,
 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2
 Means, Methods, Techniques, Sequences and
 Procedures of Construction
 3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2
 Mechanic's Lien
 2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
 Mediation
 8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, 15.3, 15.4.1,
 15.4.1.1
 Minor Changes in the Work
 1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, 7.4
MISCELLANEOUS PROVISIONS
 13

Modifications, Definition of
1.1.1
Modifications to the Contract
1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7,
10.3.2
Mutual Responsibility
6.2
Nonconforming Work, Acceptance of
9.6.6, 9.9.3, 12.3
Nonconforming Work, Rejection and Correction of
2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4,
12.2
Notice
1.6, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4,
3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4,
8.2.2, 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1,
13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5,
15.1.6, 15.4.1
Notice of Cancellation or Expiration of Insurance
11.1.4, 11.2.3
Notice of Claims
1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, 15.1.3, 15.1.5,
15.1.6, 15.2.8, 15.3.2, 15.4.1
Notice of Testing and Inspections
13.4.1, 13.4.2
Observations, Contractor's
3.2, 3.7.4
Occupancy
2.3.1, 9.6.6, 9.8
Orders, Written
1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2,
14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Evidence of Financial Arrangements
2.2, 13.2.2, 14.1.1.4
Owner, Information and Services Required of the
2.1.2, 2.2, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5,
9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1,
13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Owner's Authority
1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2,
4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1,
7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2,
10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4,
15.2.7
Owner's Insurance
11.2
Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2
Owner's Right to Carry Out the Work
2.5, 14.2.2
Owner's Right to Clean Up
6.3
Owner's Right to Perform Construction and to Award

Separate Contracts
6.1
Owner's Right to Stop the Work
2.4
Owner's Right to Suspend the Work
14.3
Owner's Right to Terminate the Contract
14.2, 14.4
Ownership and Use of Drawings, Specifications and
Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, 1.5, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12,
5.3
Partial Occupancy or Use
9.6.6, 9.9
Patching, Cutting and
3.14, 6.2.5
Patents
3.17
Payment, Applications for
4.2.5, 7.3.9, 9.2, 9.3, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1,
14.2.3, 14.2.4, 14.4.3
Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1,
9.10.3, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, 9.7, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, 9.10, 12.3, 14.2.4, 14.4.3
Payment Bond, Performance Bond and
7.3.4.4, 9.6.7, 9.10.3, 11.1.2
Payments, Progress
9.3, 9.6, 9.8.5, 9.10.3, 14.2.3, 15.1.4
PAYMENTS AND COMPLETION
9
Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2
PCB
10.3.1
Performance Bond and Payment Bond
7.3.4.4, 9.6.7, 9.10.3, 11.1.2
Permits, Fees, Notices and Compliance with Laws
2.3.1, 3.7, 3.13, 7.3.4.4, 10.2.2
PERSONS AND PROPERTY, PROTECTION OF
10
Polychlorinated Biphenyl
10.3.1
Product Data, Definition of
3.12.2
Product Data and Samples, Shop Drawings
3.11, 3.12, 4.2.7
Progress and Completion
4.2.2, 8.2, 9.8, 9.9.1, 14.1.4, 15.1.4
Progress Payments
9.3, 9.6, 9.8.5, 9.10.3, 14.2.3, 15.1.4
Project, Definition of
1.1.4
Project Representatives

4.2.10
 Property Insurance
 10.2.5, 11.2
 Proposal Requirements
 1.1.1
 PROTECTION OF PERSONS AND PROPERTY
 10
 Regulations and Laws
 1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1,
 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8,
 15.4
 Rejection of Work
 4.2.6, 12.2.1
 Releases and Waivers of Liens
 9.3.1, 9.10.2
 Representations
 3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1
 Representatives
 2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1
 Responsibility for Those Performing the Work
 3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10
 Retainage
 9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
 Review of Contract Documents and Field Conditions
 by Contractor
 3.2, 3.12.7, 6.1.3
 Review of Contractor's Submittals by Owner and
 Architect
 3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2
 Review of Shop Drawings, Product Data and
 Samples by Contractor
 3.12
 Rights and Remedies
 1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1,
 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2,
 12.2.4, 13.3, 14, 15.4
 Royalties, Patents and Copyrights
 3.17
 Rules and Notices for Arbitration
 15.4.1
 Safety of Persons and Property
 10.2, 10.4
 Safety Precautions and Programs
 3.3.1, 4.2.2, 4.2.7, 5.3, 10.1, 10.2, 10.4
 Samples, Definition of
 3.12.3
 Samples, Shop Drawings, Product Data and
 3.11, 3.12, 4.2.7
 Samples at the Site, Documents and
 3.11
 Schedule of Values
 9.2, 9.3.1
 Schedules, Construction
 3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
 Separate Contracts and Contractors
 1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2
 Separate Contractors, Definition of

6.1.1
 Shop Drawings, Definition of
 3.12.1
 Shop Drawings, Product Data and Samples
 3.11, 3.12, 4.2.7
 Site, Use of
 3.13, 6.1.1, 6.2.1
 Site Inspections
 3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4
 Site Visits, Architect's
 3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
 Special Inspections and Testing
 4.2.6, 12.2.1, 13.4
 Specifications, Definition of
 1.1.6
 Specifications
 1.1.1, 1.1.6, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14
 Statute of Limitations
 15.1.2, 15.4.1.1
 Stopping the Work
 2.2.2, 2.4, 9.7, 10.3, 14.1
 Stored Materials
 6.2.1, 9.3.2, 10.2.1.2, 10.2.4
 Subcontractor, Definition of
 5.1.1
 SUBCONTRACTORS
 5
 Subcontractors, Work by
 1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4,
 9.3.1.2, 9.6.7
 Subcontractual Relations
 5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1
 Submittals
 3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3,
 9.8, 9.9.1, 9.10.2, 9.10.3
 Submittal Schedule
 3.10.2, 3.12.5, 4.2.7
 Subrogation, Waivers of
 6.1.1, 11.3
 Substances, Hazardous
 10.3
 Substantial Completion
 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3,
 12.2, 15.1.2
 Substantial Completion, Definition of
 9.8.1
 Substitution of Subcontractors
 5.2.3, 5.2.4
 Substitution of Architect
 2.3.3
 Substitutions of Materials
 3.4.2, 3.5, 7.3.8
 Sub-subcontractor, Definition of
 5.1.2
 Subsurface Conditions
 3.7.4
 Successors and Assigns

13.2
Superintendent
3.9, 10.2.6
Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4,
7.1.3, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4
Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6,
9.10.5, 14.2.1
Surety
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2,
15.2.7
Surety, Consent of
9.8.5, 9.10.2, 9.10.3
Surveys
1.1.7, 2.3.4
Suspension by the Owner for Convenience
14.3
Suspension of the Work
3.7.5, 5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
Taxes
3.6, 3.8.2.1, 7.3.4.4
Termination by the Contractor
14.1, 15.1.7
Termination by the Owner for Cause
5.4.1.1, 14.2, 15.1.7
Termination by the Owner for Convenience
14.4
Termination of the Architect
2.3.3
Termination of the Contractor Employment
14.2.2

TERMINATION OR SUSPENSION OF THE CONTRACT

14
Tests and Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3,
9.9.2, 9.10.1, 10.3.2, 12.2.1, 13.4
TIME
8
Time, Delays and Extensions of
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, 8.3, 9.5.1, 9.7,
10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5
Time Limits

2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2,
5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3,
9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14,
15.1.2, 15.1.3, 15.4
Time Limits on Claims
3.7.4, 10.2.8, 15.1.2, 15.1.3
Title to Work
9.3.2, 9.3.3
UNCOVERING AND CORRECTION OF WORK
12
Uncovering of Work
12.1
Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3
Unit Prices
7.3.3.2, 9.1.2
Use of Documents
1.1.1, 1.5, 2.3.6, 3.12.6, 5.3
Use of Site
3.13, 6.1.1, 6.2.1
Values, Schedule of
9.2, 9.3.1
Waiver of Claims by the Architect
13.3.2
Waiver of Claims by the Contractor
9.10.5, 13.3.2, 15.1.7
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, 15.1.7
Waiver of Consequential Damages
14.2.4, 15.1.7
Waiver of Liens
9.3, 9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, 11.3
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2,
15.1.2
Weather Delays
8.3, 15.1.6.2
Work, Definition of
1.1.3
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3,
13.2, 13.3.2, 15.4.4.2
Written Interpretations
4.2.11, 4.2.12
Written Orders
1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Exhibit A, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications (referred to herein interchangeably as “Plans” and/or “Specifications”), Addenda issued prior to execution of the Contract, other documents listed in the Agreement, 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. The Contract Documents shall include the Bidding Requirements, including, but not limited to Advertisement or Invitation to Bid, Instructions to Bidders, the Contractor’s Bid Proposal Form and other bidding forms, or portions of the Addenda relating to any Bidding Documents. The Contract Documents shall apply to all Prime Contractors for the Project and each Prime Contractor is responsible for the content of all.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. 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 Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect’s consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect’s consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect’s duties.

§ 1.1.2.1 The Contractor acknowledges and warrants that it has closely examined all of the Contract Documents, that they are suitable and sufficient to enable the Contractor to complete the Work in a timely manner for the Contract Sum, and that they include all Work, whether or not shown or described, which reasonably may be inferred to be required or useful for the completion of the Work in full compliance with all applicable codes, laws, ordinances and regulations and that questions regarding the bid documents and any interpretation(s) regarding same have been asked by the contractor, in the form and manner required in the instructions to bidders.

§ 1.1.3 The Work

The term “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.

§ 1.1.3.1 The Contractor is strongly encouraged to visit the site of the Project before submitting a bid. Such site visit shall be for the purpose of familiarizing the Contractor with the conditions as they exist and the character of the operations to be carried on under the Contract Documents, including all existing site conditions, access to the site, physical characteristics of the site and surrounding areas.

§ 1.1.3.2 Nothing in these General Conditions shall be interpreted as imposing on either the Owner or Architect, or their respective agents, employees, officers, directors or consultants, any duty, obligation or authority with respect to any items that are not intended to be incorporated into the completed project, including but not limited to shoring, scaffolding, hoists, temporary weatherproofing, or any temporary facility or temporary activity, since these are the sole responsibility of the Contractor.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are 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.

§ 1.1.5.1 The Drawings are diagrammatical and show the general arrangement and extent of the Work; exact locations and arrangements of parts shall be determined as the Work progresses and shall be subject to the Architect's approval.

- .1 No extra compensation will be allowed due to discrepancies between actual dimensions and those indicated.
- .2 The right is reserved by the Architect to make any reasonable change in location of equipment, ductwork, and piping prior to roughing in without involving additional expense to the Owner.
- .3 Contractor shall coordinate his/her Work within the Work of others, and shall be responsible for the coordination so that interference between mechanical, electrical and other work and the architectural and structural work does not occur.
- .4 Contractor shall furnish and install supports, hangers, offsets, bends, turns, and the like in connection with this Work to avoid interference with work of other Contractors, to conceal Work where required, and to secure necessary clearance and access for operation and maintenance without involving additional expense to the Owner.

§ 1.1.6 The Specifications

The Specifications are 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.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The general character of the detail work is shown on the drawings, but minor modifications may be made in large scale details. Where the word "similar" occurs on the drawings, it shall be used in its general sense and not as meaning identical, and all details shall be worked out in relation to their location and their connection to other parts of the work.

- .1 Where on any drawings a portion of the work is drawn out and the remainder is indicated in outline, the parts drawn out shall apply also to other like portions of the work.
- .2 Where detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts in the work unless otherwise indicated.
- .3 In case of differences between small and large-scale drawings, the larger scale drawings shall take precedence. Dimensions given shall take precedence over scale measurements.
- .4 Any discrepancies or questions as to the application of, and interpretations related to 1.2.1.1, shall be referred to the Architect for adjustment before any work affected thereby has been performed.

§ 1.2.1.2 During the course of the work, should any ambiguities or discrepancies be found in the Specifications or on the Drawings; or should there be found any discrepancies between the Drawings and Specifications to which the Contractor has failed to call attention before submitting his/her bid, then the Architect will interpret the intent of the Drawings and Specifications; and the Contractor hereby agrees to abide by the Architect's interpretation and to carry out the work in accordance with the decision of the Architect.

§ 1.2.1.3 It is expressly stipulated that neither the Drawings nor the Specifications shall take precedence over the other, and it is further stipulated that the Architect may interpret or construe the Drawings and Specifications so as to secure in all cases the result most consistent with the needs and requirements of the work. In the event of such ambiguity or discrepancy subject to any Architect's interpretation, the Contractor shall comply with the more stringent requirement, and supply the better quality or greater quantity of work.

§ 1.2.1.4 The invalidity of any provisions of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.2.1 The various materials and products specified in the Specifications by name or description are given to establish a standard of quality and of cost for bid purposes. It is not the intent to limit the acceptance to any one material or product specified, but rather to name or describe it as the absolute minimum standard that is desired and acceptable, all determinations as to equality of a proposed product or material shall be at the discretion of the Architect and/or the Owner.

- .1 A material or product of lesser quality will not be acceptable.
- .2 Where "Basis of Design" products or manufacturer's names are used, whether or not followed by the words "Or Approved Equal", they shall be subject to approved equals and authorized only by the Architect and/or the Owner.

§ 1.2.2.2 Substitutions lowering performance, quality, method of assembly or installation, or in general not in keeping with details and specifications, will not be permitted. Refer to substitution procedure indicated elsewhere in the Contract Documents.

§ 1.2.2.3 It is understood when a bid for any product or material is submitted, the bidder is aware of specified requirements and all materials or products within his/her bid are equal or better than such specified items.

§ 1.2.2.4 In addition to the Specifications, it shall be understood that details on Drawings shall become part of the Specification in determining the required "Standard of Quality".

§ 1.2.2.5 If a conflict occurs between the Drawing details and Specifications, the bidder during the bidding process and/or Contractor shall bring such conflicts to the attention of the Architect in accordance with applicable requirements indicated elsewhere in other sections of the Contract Documents.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity, the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or

Init.

distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Digital Data Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

(Paragraph Deleted)

§ 1.9 Execution of Contract Documents

(Paragraph Deleted)

§ 1.9.1 The Contract Documents shall be signed by the Owner and Contractor. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request. The Agreement shall be signed in not less than quadruplicate by the Owner and Contractor.

§ 1.9.2 Execution of the Contract by the Contractor is a representation that said Contract Documents are full and complete, are sufficient to have enabled the Contractor to determine the cost of the Work therein to enter into the Contract and that the Contract Documents are sufficient to enable it to construct the Work outlined therein, and otherwise to fulfill all its obligations hereunder, including, but not limited to, Contractor's obligation to construct the Work for an amount not in excess of the Contract Sum on or before the date(s) of Substantial Completion established in the Agreement. The Contractor further acknowledges and declares that it has visited and examined the site, examined all physical, legal, and other conditions affecting the Work and is fully familiar with all of the conditions thereon and thereunder affecting the same. In connection therewith, Contractor specifically represents and warrants to Owner that it has, by careful examination, satisfied itself as to: (1) the nature, location and character of the Project and the site, including, without limitation, the surface and subsurface conditions of the site and all structures and obstructions thereon and thereunder, both natural and man-made, and all surface and subsurface water conditions of the site and the surrounding area; (2) the nature, location, and character of the general area in which the Project is located, including

without limitation, its climatic conditions, available labor supply and labor costs, and available equipment supply and equipment costs; and (3) the quality and

quantity of

all materials, supplies, tools, equipment, labor, and professional services necessary to complete the Work in the manner and within the cost and time frame required by the Contract Documents. In connection with the foregoing, and having carefully examined all Contract Documents, as aforesaid, and having visited the site, the contractor acknowledges and declares that it has no knowledge of any discrepancies, omissions, ambiguities, or conflicts in said Contract Documents and that if it becomes aware of any such discrepancies, omissions, ambiguities, or conflicts, it will promptly notify Owner and Architect of such fact.

§ 1.9.3 The Contract Documents include all items necessary for the proper execution and completion of the Work by the Contractor. The Work shall consist of all items specifically included in the Contract Documents as well as all additional items of work which are reasonable inferable from that which is specified in order to complete the Work in accordance with the Contract Documents. The Contract Documents are complementary, and what is required by any one Contract Document shall be as binding as if required by all. Any differences between the requirements of the Drawings and the Specifications or any differences noted within the Drawings themselves or within the Specifications themselves have been referred to the Owner and Architect by Contractor prior to the submission of bids and have been clarified by an Addendum issued to all bidders.

If any such differences or conflicts were not called to the Owner's and Architect's attention prior to submission of bids, the Architect shall decide which of the conflicting requirements will govern based upon the most stringent of the requirements, and, subject to the approval of the Owner, the Contractor shall perform the Work at no additional cost and/or time to the Owner in accordance with the Architect's decision. Work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonable inferable therefrom as being necessary to produce the intended results.

1.9.3.1 The term "reasonably inferable" includes work necessary to "provide" work indicated or specified, as defined in section: Definitions and Standards; that is: furnish and install, complete, in place and ready for use.

1.9.3.2 Details referenced to portions of the Work shall apply to other like portions of the Work not otherwise detailed.

1.9.3.3 The Contractor shall request, from the Architect interpretation of apparent discrepancies, conflicts, or omissions in the Specifications and Drawings. Subcontractors shall forward such requests through the Contractor. Such requests, and the Architect's interpretation, shall be in written form; other forms of communications shall be used to expedite resolution of concerns, but will not be binding.

§1.9.4 Explanatory notes shall take precedence over conflicting drawn note indications. Large scale drawings shall take precedence over small scale drawings. Figured dimensions shall take precedence over scaled measurements. Should contradictions be found, the Architect shall determine which indication is correct.

§1.9.5 Where it is required in the specifications that materials, products, processes, equipment, or the like be installed or applied in accordance with manufacturers' instructions, directions, or specifications, or words to this effect, it shall be construed to mean that said application or installation shall be in strict accordance with printed material concerned for use under conditions similar to those at the job site. Three copies of such instructions shall be furnished to the Architect and his written approval thereof obtained before work is begun.

§1.9.6 Any material specified by reference to the number, symbol, or title of a Commercial Standard, Federal Specification, ASTM Specification, trade association standard, or other similar standards, shall comply with the requirements in the latest revision thereof and any amendments or supplements thereto in effect one month prior to the date on which bids are opened and read, except as limited to type, class, or grade, or modified in such reference. The standards referred to, except as modified in the specifications, shall have full force and effect as though printed in the specifications. The Architect will furnish upon request information as to how copies of the standards referred to may be obtained.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.3 Information and Services Required of the Owner

(Paragraph Deleted)

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

(Paragraphs Deleted)

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, or fails or refuses to provide a sufficient amount of properly supervised and coordinated labor, materials, or equipment so as to be able to complete the Work within the Contract Time or fails to remove and discharge (within ten days) any lien filed upon Owner's property by anyone claiming by, through, or under Contractor, or disregards the instructions of Architect or Owner when based on the requirements of the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for Owner's Professionals, including but not limited to the Architect's and Construction Manager's, and Attorney's additional services made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor and/or his surety shall pay the difference to the Owner.

§ 2.5.1 The Owner shall have the authority to immediately correct, service, repair, replace or otherwise make operational any component of their facilities including equipment if in the sole discretion of the Owner the damaged component is a threat to safety or security. The Owner is obligated to put the Contractor on notice of the issue threatening safety or security, and their intent to remedy immediately with other resources and to back charge the contractor for the cost of said service, but there are no notice provisions required for the corrective actions necessary to protect the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have

Init.

express authority to bind the Contractor with respect to all matters under this Contract. The term “Contractor” means the Contractor or the Contractor’s authorized representative.

3.1.1.1 The term “Contractor” shall mean and apply with equal force to each respective Prime Contractor and all other Contractors having a direct Contract with the Owner, or with each respective Contractor or other Prime Contractor for other branches of the Work, or his authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect’s administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

- .1 If the Contractor requires clarification of the intent of the Contract Documents after award, the Contractor shall be responsible to issue a type written Request for Information (RFI) to the Architect utilizing the Architect’s sample form via acceptable methods set forth in Section 4.2.4.
- .2 All RFI’s shall clearly identify the Architect’s project number, the Construction Company name, author’s name, date issued, address, phone number(s), facsimile number and the addressee of the communication.
- .3 RFI’s shall be sequentially identified and numbered when issued to the Architect with the following prefix for each trade and shall be logged accordingly:
 - S – Structural Work (ex. S1, S2, etc.)
 - P/FP – Plumbing / Fire Protection Work
 - H – Heating, Ventilating, Air Conditioning, Refrigeration Work (HVACR)
 - E – Electrical / Information Technology Work
 - G – General Construction Work
- .4 RFI’s involving Structural, Plumbing / Fire Protection, HVACR or Electrical Work shall be addressed and issued to the Architect and simultaneously issued directly to the respective Consulting Engineer.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. To that end, the Contractor shall at once report to the Architect errors, inconsistencies or omissions discovered. If the Contractor performs any construction activity involving an error, inconsistency or omission in the Contract Documents that the Contractor recognized or reasonably should have recognized without such notice to the Architect, the Contractor shall assume complete responsibility for such performance and shall bear the full amount of the attributable costs for correction. It is recognized that the Contractor’s review is made in the Contractor’s capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents. However, any design errors or omissions noted by the Contractor during this review shall be reported promptly to the Architect.

§ 3.2.2.1 Conditions Precedent – Notice

- .1 Notice of any alleged Conflict that have been reasonably identified prior to submitting a Bid shall be provided to the Architect immediately in order that the Architect in its discretion, may issue an Addendum.
- .2 A Bidder’s failure to do so constitutes an absolute waiver of any Conflict that may thereafter be asserted with respect thereto and shall bar any recovery regarding such Conflict.
- .3 If any errors, inconsistencies or omissions appear in the drawings, specifications or other Contract Documents, which should reasonably have been discovered and concerning which interpretation had not been obtained from the Architect during the Bidding Period, the Contractor shall within ten (10) days after written “Notice of Award”, notify the Architect in writing of such error, inconsistency or omission. In the event the Contractor fails to give such notice, the Contractor and its Surety will indemnify the Owner for the costs of any such errors, inconsistencies or omissions and the cost of rectifying same including attorney’s fees. Interpretation of this procedure after the ten-day period will be made by the Architect and his/her decision will be final. By Submission of a Bid, the Contractor acknowledges that the Contract

Init.

Documents are full and complete, are sufficient to have enabled it to determine the cost of the Work and that the Drawings, the Specifications and all Addenda are sufficient to enable the Contractor to construct the Work outlined therein in accordance with applicable laws, statutes, ordinances, building codes and regulations, and otherwise to fulfill all of its obligations under the Contract Documents.

- .4 Contractor acknowledges, except as to any reported error, inconsistencies or omissions, and to concealed or unknown conditions defined in elsewhere, by executing the Agreement, the Contractor represents the following:
- .1 The Contract Documents are sufficiently complete and detailed for the Contractor to perform the Work and comply with all requirements of the Contract Documents.
 - .2 The Work required by the Contract Documents, including, without limitation, all construction details, construction means, methods, procedures, and techniques necessary to perform the Work, use of materials, selection of equipment, and requirements of products by manufacturers are consistent with:
 - .1 good and sound practices within the construction industry;
 - .2 generally prevailing and accepted industry standards applicable to Work;
 - .3 requirements of any warranties applicable to the Work; and
 - .4 all laws, ordinances, regulations, rules, and orders which bear upon the Contractor's performance of the Work.
 - .3 The Contractor has read, understands and accepts the Contract Documents and its Bid was made in accordance with them.
 - .4 The Contract Sum is based upon the products, materials, systems and equipment required by the Contract Documents without exception. Where the Contract Documents list one or more manufacturer or brand name products, materials, systems and equipment as acceptable, the Contract Sum is, in each instance, based upon one of the listed manufacturers or brand name products, materials, systems and equipment, or, if the Contract Sum is based upon the substitution of an "or equal" manufacturer or product, material, system or equipment, the Contractor has in each such instance sought and received the Architect's approval for the substitution either:
 - .1 prior to the Bid in accordance with the Architect's Addenda;
 - .2 after commencement of the Work, under in conformance with substitution procedures elsewhere in the Contract Documents.
 - .5 The Contract Sum is firm and is all inclusive and no escalation is contemplated for any reason whatsoever.
 - .1 The Contract Sum includes any and all costs associated with completion by those dates and times, including any and all costs associated with out-of-sequence work, come-back work, stand-by work, stacking of Trades, coordination with the schedules and work of separate Contractors, allowing sufficient time, work and storage areas, and site access for separate Contractors to timely progress and complete their work, overtime, expediting and acceleration that may be required to complete the work by those dates and times.
 - .2 The Contractor has reviewed the completion dates and times, and Milestone dates set forth in the Contract Documents, agrees that such dates and times are reasonable and commits to achieve them.
 - .6 The Contractor shall satisfy itself as to the accuracy of all dimensions and locations. In all cases of interconnection of its work with existing or other work, it shall verify at the site, all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to verify all such locations or dimensions shall be promptly rectified by the Contractor without any additional cost to the Owner. Deviations from the construction documents must be noted by the Contractor at the time of shop drawing submission. Failure to do so will result in the implication of Section 3.2 of the General Conditions paragraphs 3.2.2 and 3.2.3 above.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations

of Sections 3.2.2 or 3.2.3, the Contractor and/or his/her Surety shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, unless the Contractor recognized such error, inconsistency, omission or difference and yet knowingly failed to timely report it to the Architect.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

- .1 At any time within the construction period, the Owner or Architect shall have the right to require the replacement of the Prime Contractor's Project Manager, Superintendent, or Foreman.
- .2 The Owner or Architect shall have the authority to direct the Contractor to assign additional supervisory personnel to ensure compliance with the Contract schedule and qualify requirements at no addition to the Contract price.
- .3 When more than one major phase is being constructed at different locations on the project site, supervision must be assigned to each phase when work of that contract is being performed. When performing construction work to maintain the progress schedule requires extended hours, multiple shifts, and additional work days, adequate supervision shall be required for each Contractor during these times. The competence level and ability of supervisory personnel must be adequate to perform the construction activities involved and shall be in accordance with requirements indicated elsewhere in the Contract Documents.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 Contractor shall lay out his/her own work and be responsible for all lines, elevations and measurements of the building and other work executed by him under the Contract. He/She must exercise proper precaution to verify the figures shown on the Drawings before laying out the work and will be held responsible for any errors resulting from his/her failure to exercise such precaution.

- .1 Contractors whose failure to perform his/her Work or whose negligence in performing his/her Work, negatively impacts other Contractors' work shall be responsible for damages incurred by the other Contractors that are necessary to maintain the project schedules, all as is more fully set forth in the further provisions of the Contract Documents including, without limitation, Section 6.2.5 of the General Conditions.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. It shall be Contractor's sole responsibility to provide sufficient labor and workforces to properly execute and complete the work within the timeframe contemplated within this Contract for the completion of said work.

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§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.2.1 Standard of Quality: The various materials and products specified in the Specifications by name or description are given to establish a standard of quality and of cost for bid purposes.

- .1 It is not the intent to limit the Contractor to any one material or product specified, but rather to describe as the minimum standard.
- .2 When proprietary names are used as the “Basis of Design”, for specified products or equipment, they shall be followed by the words, “or approved equal in quality necessary to meet the specifications”, unless otherwise indicated elsewhere in the Contract Documents.

§ 3.4.2.2 The Architect will evaluate alternatives and substitutions and shall be the sole judge of whether the alternatives (substitutions), are acceptable or not.

- .1 The burden of proving the alternatives (substitutions), are equal or better to the specified product is that of the Contractor.
- .2 Contractor shall submit request for substitution in accordance with substitution procedures indicated elsewhere in the Contract Documents.
- .3 Any alternative names or products which do not meet the Specifications will not be accepted.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor’s employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4 The Contractor must provide suitable storage facilities at the site for the proper protection and safe storage of his materials. Such storage facilities must be approved in advance in writing by the Architect.

§ 3.4.5 All materials delivered to the premises which are to form a part of the work are to be considered the property of the Owner and must not be removed without the Architect’s consent; but the Contractor shall remove all surplus materials upon completion of each phase of the work and as directed by the Architect.

§ 3.4.6 When any room is used as a shop, storeroom, etc., during the progress of the work, the Contractor making use of the space will be responsible for any repairs, patching, or cleaning arising from such use. Prior approval of Architect for use of such areas is mandatory.

§ 3.4.7 Not later than seven (7) days from the Notice to Proceed, the Contractor shall provide a list showing the name of the manufacturer proposed to be used for each of the products identified in the Specifications, and the installing Subcontractor’s name, if any.

§ 3.4.8 The Contractor will be held to be thoroughly familiar with all conditions affecting labor in the locale of the Project, including, but not limited to, trade jurisdiction and agreements, incentive and premium time, pay, procurement, living and commuting conditions. Contractor shall assume responsibility for costs resulting from his failure to verify conditions affecting his labor.

§ 3.4.9 Contractor shall be responsible for labor peace on the Project and shall at all times make its best efforts and judgment as an experienced contractor to adopt and implement policies and practices designed to avoid work stoppages, slowdowns, disputes, or strikes where reasonably possible and practical under the circumstances, and shall at all times maintain Project-wide labor harmony. Except as specifically provided in Subparagraph 8.3.1, Contractor shall be liable to Owner for all damages suffered by Owner occurring as a result of work stoppages, slowdowns, disputes, or strikes.

§ 3.4.10 Wherever practical or required to obtain a full warranty, except as otherwise specified, the material or product of one manufacturer shall be used throughout the Work for each specified purpose.

§ 3.4.11 All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in strict accordance with the manufacturer's directions. Should discrepancies arise between these instructions and the Specifications, the Contractor shall request, in writing, clarification from the Architect.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

The Contractor represents that all manufacturer and supplier warranties shall run directly to or be specifically assignable to the Owner. The Contractor warrants that all portions of the work that will be covered by a manufacturer's or supplier's warranty shall be performed in such a manner so as to preserve all rights under such warranties. The Contractor hereby assigns to the Owner effective upon the termination of this contract all manufacturer's and supplier's warranties relating to the Work, and the Contractor shall upon request of the Owner, execute any document reasonably requested by Owner to effectuate such assignment. If the Owner attempts to enforce a claim based upon a manufacturer's or suppliers warranty and such manufacturer or supplier refuses to honor such warranty based in whole or in part on a claim of defective installation by the Contractor, the Contractor shall be responsible for any resulting loss or damages incurred by the Owner as a result of the manufacturer's or supplier's refusal to honor such warranty. The Contractor's obligations under this Subparagraph 3.5.1 shall survive the expiration or earlier termination of the Contract. The warranty period for all work of each Contractor shall be two (2) years from the date of final inspection and acceptance by the Owner unless otherwise specified.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.5.3 The Contractor shall forward guarantee and warranty registration cards to the manufacturers in the name of the Owner showing date of acceptable Substantial Completion of the Work as the beginning date for guarantee and warranty periods.

- .1 All warranties and guarantees shall be in accordance with requirements indicated in applicable Sections of the Contract Documents.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.6.2 The Contractor shall pay all social security taxes, unemployment insurance, contributions, or other taxes measured by wages of employees, attributable to, or performing the Work.

§ 3.6.3 Municipal authorities and school boards of education are exempt organizations under the provisions of the New Jersey Sales and Use Tax Act, Public Laws of 1966, C.30,43,132,140 and are not required to pay sales tax. The Contractor shall be responsible to notify his subcontractors and suppliers. No allowance will be made by the Owner for any such taxes paid by the Contractor or his subcontractors and suppliers due to the Contractor's failure to file for appropriate exemptions, if applicable.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner shall secure and pay for the building permit. The Contractor shall secure and pay for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

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- .1 It shall be the obligation of the Contractor to review the Contract Documents and to determine and to notify the Owner and Architect of any discrepancy between building codes and regulations of which the Contractor has knowledge or should be reasonably able to determine.
- .2 The Contractor shall not violate any zoning, setback or other requirements of applicable laws, codes and ordinances, building codes, rules or regulations. The Contractor shall promptly notify the Architect in writing, and necessary changes shall be accomplished by appropriate Modification.
- .3 Contractor to pay for individual licenses.

§3.7.1.2 The required Building Permit or Permits, including other permits, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded, shall be secured by the Contractor for his trade; or by the Prime Contractor in charge of the Work when the Contract combines more than one trade under a Single Contract. This shall include permits required for the Construction Manager's Trailer.

§3.7.1.3 The Owner shall be responsible to pay for all permit applications, either directly or as a reimbursement to the Contractor.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.2.1 Subject to the other terms and conditions of these General Conditions, it is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and 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 and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

§3.7.2.2 The Contractor shall comply with all regulations of the Uniform Construction Code of the State of New Jersey and any of its amendments as they are made official.

§3.7.2.3 Any standard, code, guide, regulation, or specification referred to in the Contract Documents shall refer to the latest edition or amendment thereto of said standard, etc., as of the date of the Contract, except where a specific edition is noted.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but

shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts; and
- .2** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a full-time competent superintendent and necessary assistants, acceptable to the Owner and the Architect, who shall be in attendance at the Project site during performance of the Work and until Final Completion of all Work including all corrective and punch list items. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.9.4 A superintendent for the contractor shall be required for the overall project and a Foreman shall be required at each project site. The number of necessary Assistants to the superintendent shall be the areas where work is in progress shall be adequately supervised by the Contractor's superintendent or one of his assistants. If, in the Architect, Engineer, or Construction Manager's opinion, the quality or progress of the work are adversely affected by lack of adequate supervision, the Contractor shall be required to increase the number of supervisory personnel at no increase in the Contract Sum.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

- .1** Within fifteen (15) days after the date of the Notice to Proceed, the Contractor shall submit to the Architect, on forms supplied by the Architect, a Critical Path Method (CPM) with arrow network diagram Progress Schedule upon which shall be indicated the dates for starting and the dates for completion of all contracts and all divisions of the work in a manner which will coincide with the Time for Completion. Contractor's Construction Schedule shall be in accordance with requirements indicated elsewhere in the Contract Documents.

- .2 The Contractor shall cooperate and consult with other Prime Contractors during the construction of this project. The Contractor shall schedule and execute his/her Work so as to avoid delay to other Prime Contractors. The Contractor is financially responsible to the other Prime Contractors for delay caused by him/her to other Prime Contractors on the Project who are intended to and shall be third party beneficiaries of the Contractor's promise herein above stated in accordance with the further provisions of the Contract Documents, including, without limitation, Section 6.2.5 of the General Conditions. If contrary to the foregoing, another Prime Contractor shall assert a claim or file an action directly against the Owner on account of delay for which the Contractor is allegedly responsible, the Contractor and its Surety shall indemnify and Hold Harmless the Owner and Architect for such claims, losses or delays of any kind made by another Prime Contractor; provided however, that this indemnity obligation is for the sole and exclusive benefit of the Owner and Architect and shall not be applied to the benefit of any Prime Contractor.
- .3 The Contractor shall immediately, after being awarded the contract, prepare and submit to the Architect, a submittal schedule which will be reviewed by the Architect for the orderliness of the submittals by the Contractor. This schedule shall be provided to the Architect for approval by the Architect within fourteen (14) days of receipt of Contract by the Contractor. The schedule shall be coordinated with the Project's Construction Schedule and shall allow the Architect reasonable time to review submittals.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.10.4 The General Construction Work Contractor (and/or the assigned lead Contractor) shall be the scheduling Coordinator and shall perform all duties and assume all of the responsibilities of the Scheduling Coordinator as set forth in the Contract Documents and shall in addition to the requirements of other sections of the Contract Documents.

- .1 If the General Construction Work Contractor fails to perform its duties as the Scheduling Coordinator adequately or to the Owner's satisfaction, the Owner may, in addition to its other rights and remedies, appoint a substitute Scheduling Coordinator who shall act in the place and with the authority of the original Scheduling Coordinator. In that event, the Owner may, in its sole discretion, choose one of the Separate Prime Contractors or an Independent Consultant as the substitute Scheduling Coordinator. The cost and expense incurred by the Owner to engage such substitute scheduling Coordinator shall be charged to and borne by the General Construction Work Contractor and its Surety.
- .2 The Contractor's failure to cooperate and participate with the Owner and separate Prime Contractors in the development and review of construction schedules as provided in this Section 3.10 shall be a material breach of its obligations, entitling the Owner to exercise all rights and remedies under the Contract Documents and applicable law.
 - .1 In no event shall any revision to any construction schedule constitute the basis for an adjustment in the Contract time or the Contract Sum unless such adjustment is agreed to by the Owner, the Architect and achieved by a Change Order.
 - .2 Float shall belong to the Project and all "float time" belongs exclusively to the Owner and may be used as the Owner, if in its sole discretion determines.

§3.10.5 The Contractor shall cooperate with the Owner in providing schedule updates and notification notices which may impact the Owner's operations. The Contractor will coordinate with the Owner to provide school bus companies, trash hauling companies, and others with the proposed construction schedules, anticipated detours, and durations.

§3.10.6 The Contractor shall work his forces overtime at his expense if required to maintain the Progress Schedule established.

§3.10.7 The Contractor shall make proper assignments of employees in order to preclude labor, jurisdiction, or like dispute and if such disputes arise, to do all things necessary to effect a prompt settlement thereof including reference of such disputes to labor representatives or other established construction industry agencies for resolution, and be bound by their decisions.

§3.10.8 The Contractor shall perform the work in accordance with the most recent schedule submitted to the Architect. In the event the Contractor fails to perform work in accordance with the schedule, at the Architect's request, the Contractor shall provide a recovery schedule, reflecting the Contractor's commitment to complete the work in accordance with the contract documents, including but not limited to double shifts, overtime, evening and weekend work, at the Contractor's expense. Nothing contained herein shall be construed so as to prevent the Owner from resorting to its contractual remedies, including but not limited to assessment of liquidated damages, withholding of certification of payment, and termination due to Contractor's failure to perform work in accordance with the schedule.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

(Paragraph Deleted)

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

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§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.

- .1** Contractor, for itself, its successors and assigns, agrees to indemnify and save Owner, the individual members (past, present and future), its successors, assigns, employees, agent, Architect, Engineers, harmless from and against any and all claims, demands, damages, actions or causes of action by any party, together with any and all losses, costs or expenses in connection therewith or related thereto, including, but not limited to, attorney fees and costs of suit for bodily injuries, death or property damage arising in or in any manner growing out of the work performed, or to be performed under this Contract. Contractor and its successors and assigns agree to indemnify the Owner, its individual members (past, present and future), its successors, assigns, employees, agents, Architect, and Engineers against all fines, penalties or losses incurred for, including, but not limited to, attorney fees and costs of suit, or by reason of the violation by Contractor in performance of this Contract, or any ordinance, regulation, rule of law of any political subdivision or duly constituted public authority. Without limiting the foregoing, the Contractor, at the request of Owner, its individual members (past, present, future), its successors, assigns, employees, agents, Architect, or Engineers, agree to defend at the Contractor's expense, any suit or proceeding brought against Owner, its individual members (past, present, future), its successors, assigns, employees, agents, Architect, Engineers due to, or arising out of the work performed by the Contractor.
- .2** The Contractor assumes the entire risk, responsibility, and liability for any damage or injury of every kind and nature whatsoever (including death, resulting therefrom) to all persons, whether employees of the Contractor or otherwise, and to all property (including the Work itself) caused by, resulting from, arising out of or occurring in connection with the execution of the Work, or in preparation for the Work, or any extension, modification, or amendment to the Work by the Change Order or otherwise. To the fullest extent permitted by law, the Contractor and its Surety shall indemnify and save harmless the Owner, the Architect, the Architect's Consultants, agents and employees of any of them (herein collectively called the "Indemnitees") from and against any and all liability, loss, damages, interest, judgements and liens growing out of, and any and all costs and expenses (including, but not limited to, counsel fees and disbursements) arising out of, relating to or incurred in connection with the Work including, any and all claims, demands, suits, actions or proceedings which may be made or brought against any of the Indemnitees for or in relation to any breach of the Contract for Construction or any violation of the laws, statutes, ordinances, rules, regulations, or executive orders relating to or in any way affecting the performance or breach of the Contract for Construction, whether or not such injuries to persons or damages to property are due or claimed to be due, in whole or in part, to any negligence of the Contractor or its employees, agents, subcontractors, or materialmen, excepting only such injuries and/or damages are the result of the sole gross negligence of the Owner or Architect.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

§ 3.19 Re-Design

§ 3.19.1 If the Contractor makes, or causes to be made, due to approval of substitute equipment or otherwise, any substantial change in the form, type, system and details of construction from those shown on the Drawings, he/she shall pay for all costs arising from such changes. The Contractor shall pay all Architectural and Engineering fees required to check the adequacy of such changes. Any changes or departures from the construction or details shown shall be made only after written approval from the Architect.

§ 3.19.2 The Contractor represents and warrants the following to the Owner (in addition to the other representations and warranties contained in the Contract Documents), as an inducement to the Owner to execute the Owner-Contractor Agreement, which representations and warranties shall survive the execution and delivery of the Owner-Contractor Agreement and the final completion of the Work.

- .1 that he/she is authorized to do business in the State, County, and/or City where construction will take place at the Project and is properly licensed by all necessary governmental and public authorities having jurisdiction over him/her and over the Work at the site of the Project;
- .2 that he/she is familiar with all Federal, State, Municipal and department laws, ordinances and regulations, which may in any way affect the Work of those employed herein, including but not limited to any special acts relating to the Work or to the Project of which it is a part;
- .3 that such temporary and permanent Work required by the Contract Documents as is to be done by him/her, can be satisfactorily constructed and used for the purposes for which it is intended;
- .4 that he/she is familiar with local trade jurisdictional practices at the site of the Project;
- .5 that he/she has carefully examined the plans; specifications and the site of the Work, and that from his/her own investigations, he/she has satisfied himself/herself as to the nature and location of the Work, the character, quality and quantity of the surface and subsurface materials likely to be encountered, the character of equipment and other facilities needed for the performance of the Work, and the general local conditions, and all other materials which may in any way affect the Work or his/her performance;
- .6 that he/she has determined what local ordinances, if any, will affect his/her Work. He/She has checked for any County, City, Borough, or Township rules or regulations applicable to the area in which the Project is being constructed and in addition, for any rules or regulations of other organizations having jurisdiction, such as chambers-of-commerce, planning commission, industries, or utility companies who have jurisdiction over property on which the Work will be performed. Any costs of compliance with local controls are included in the prices/bid, even if documents of such controlling agencies are not listed specifically in the Contract Documents.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment.

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The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

- .1** All project communications shall be in typewritten 8-1/2" x 11" form.
- .2** Notice of proposed changes. The Architect shall notify the Contractor of all proposed changes to the Contract Documents, after award of the Contract via type written Bulletin, or in the case of minor changes in the work, via other written instrument (letter or facsimile). The Contractor shall submit a proposal to increase or decrease the Contract Sum for approval prior to commencing with the Work change unless there is no change in the Contract Sum or time.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

§ 4.2.15 Reference in the technical provisions of the Specifications to standard specifications and test methods including those of the American Society for Testing and Materials (ASTM), the American Iron and Steel Institute (AISI), the American National Standards Institute (ANSI), the American Society of Mechanical Engineers (ASME), the American Society of Heating, Refrigeration and Air Conditioning Engineers (SSGREA), the Factory Mutual System (FM), the National Fire Protection Association (NFPA), Federal Specifications, and other similar nationally recognized technical societies and agencies shall refer to the editions and revisions current with the date of the Contract Documents.

§ 4.2.16 The Architect's decision with respect to proposed substitutions of material or equipment specified by trade name shall be final. The Architect reserves the right to waive Specifications and to accept a proposed substitution which in his/her opinion is superior to the material or product specified, or to limit the Specification to the product or equipment specified.

§ 4.2.17 Approval of substitutions shall not relieve the Contractor of responsibility for adequate fulfillment of all the various parts of the Work, nor from specified guarantees and maintenance. Modification of adjacent or connecting Work required due to any substitution approval shall be provided as part of the substitution.

§ 4.2.18 Insofar as practicable, except as otherwise specified or shown, the material or product of one manufacturer shall be used throughout the Work for each specified purpose.

§ 4.2.19 Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in strict accordance with the manufacturer's directions. Should such directions conflict with the Specifications, the Contractor shall request clarification from the Architect before proceeding.

§ 4.2.20 Responses to Requests for Information shall be issued with reasonable promptness after receipt of the request from the Contractor, unless the Architect determines that a longer time is necessary to provide an adequate response.

§ 4.2.21 In the event the Contractor believes that a response to a Request for Information will cause a change to the requirements of the Contract Documents, the Contractor shall immediately give written notice to the Owner stating that the Contractor considers the response to be a Change Order. Failure to give such written notice immediately shall waive the Contractor's right to seek additional time or cost under these General Conditions.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, within thirty (30) days, after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection. The Owner and the Architect reserve the right to reject any Work executed by parties who have not been approved by the Architect.

§ 5.2.3 Identification of Subcontractors required by N.J.S.A. shall be provided with the bid specifications in accordance with that statute. The names of all Subcontractors and material suppliers not covered by N.J.S.A. 18A:18A-18 shall be submitted for approval to the Architect and Owner not later than seven (7) days after the date of the Award of Contract unless otherwise authorized by the Architect.

- .1 The list of proposed Subcontractors shall include a description of the materials and equipment each proposes to furnish and install in the Work.
- .2 The description shall be in sufficient detail to allow the Architect to determine general conformance to Contract requirements.
- .3 Approval of the submittals required under this Article shall not relieve the Contractor from conformance to Contract requirements.
- .4 If the Architect and/or the Owner make reasonable objection to a Subcontractor, the Contractor shall substitute a Subcontractor reasonably acceptable to the Architect and the Owner at no additional cost.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.2.5 Written confirmation of award of each major subcontract shall be submitted to the Architect, in form subject to his/her approval, within seven (7) days after receipt of Architect's approval of proposed Subcontractor list as provided under Section 5.2.3 (above).

§ 5.2.6 Should material and/or workmanship of any Subcontractor prove objectionable under the provisions of the contract, and should violations of contract requirements exist, and continue after said Contractor have received a reasonable warning, then the Subcontractor shall be dismissed and removed from the Work. The Work shall be continued by others satisfactory to the Architect.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.1 The Contractor shall obligate each subcontractor specifically to comply with the New Jersey Plan of Affirmative Action to avoid discriminatory practice in employment, the applicable prevailing wage schedule of the Department of Labor of the State of New Jersey, and the Public Works (the Public Works Contractor Registration Act of the State of New Jersey).

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The General Construction Work Contractor, (and/or the assigned lead Contractor), shall act as the scheduling coordinator for all work of the Separate Prime Contractors and any other activities of the Owner's own forces and

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shall have direct responsibility for scheduling and coordination of all Work, as more specifically set forth in Article 3. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

- .1** Should the Contractor cause damage to the work or property of any Separate Contractor on the Project, the Contractor shall, upon due notice, promptly settle with such other Contractor by agreement or otherwise account of any damage alleged to have been so sustained, the Contractor shall defend such proceeding at his/her own expense, and if any judgement against the Owner arises therefrom, the Contractor shall pay or satisfy it and shall reimburse the Owner for any attorney's fees and court costs which the Owner has incurred.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14. . In the case of items furnished by one Contractor to another Contractor for installation, the installing Contractor shall accept same in writing from the Contractor furnishing same and shall assume full responsibility for protection of such items from time of delivery and acceptance.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.1.1 A field directive or field order shall not be recognized as having any impact upon the Contract Sum or the Contract Time and the Contractor shall have no claim therefor unless it shall, prior to complying with same and in

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no event no later than 10 working days from the date such direction or order was given, submit to the Owner for the Owner's approval its change proposal.

§ 7.1.1.2 When submitting its change proposal, the Contractor shall include and set forth in clear and precise detail breakdowns of labor and materials for all trades involved and the estimated impact on the construction schedule.

The Contractor shall furnish spread sheets from which the breakdowns were prepared, plus spread sheets if requested of any Subcontractors.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.1 When a Change Order involves both additions and deletions in material, the net quantity is to be determined and the appropriate overhead and profit is to be applied to the net quantity.

§ 7.2.3 Any Change Order approved by the Owner and for which payment is accepted by the Contractor, in which no adjustment in Contract Time is stipulated, shall be understood to mean that no such adjustment is required by reason of the change, and any and all rights of the Contractor or any subsequent request for adjustment of Contract Time by reason of the change is waived.

§ 7.2.7 Request for adjustment of the Contract Amount shall be submitted to the Architect and the Owner with itemized labor and material quantities and unit prices to permit proper evaluation of the request. A submission containing unsubstantiated lump sum requests for adjustment of the Contract Amount will not be considered by the Owner and Architect. The Owner and Architect will not be liable for any delay incurred by reason of the Contractor's failure to submit satisfactory justification and back-up with any request for adjustment to the Contract Amount.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, 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.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment 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, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6.1 For any extra work or portion thereof performed by the Prime Contractor, the cost to the Owner shall include the cost of the extra work plus a maximum allowance of fifteen (15%) percent for overhead and profit.

- .1 For any extra work or portion thereof performed by Subcontractor(s), the cost to the Owner shall include the cost of the extra work to the Subcontractor plus a maximum allowance of ten (10%) percent for overhead and profit, plus the Prime Contractor's overhead and profit not to exceed five (5%) percent of the Subcontractor's cost.
- .2 The cost of bonds and insurance shall be included as part of the overhead and profit.

§ 7.3.6.2 Change Orders shall include all costs, including the cost of preparation of the Change Order, all impact and ripple costs associated with modifications or delays to the work, and all costs associated with modifications to other work.

- .1 The Prime Contractor shall furnish all necessary documentation to support the additional costs, including, but not limited to the following:
 - .1 Copy of the Subcontractor's proposal.
 - .2 Complete breakdown of all costs for labor and materials.
 - .3 Complete breakdown of related costs.
 - .4 Other information as may be requested by the Architect.

§ 7.3.6.3 The overall cost of the Change Order shall be all inclusive and once accepted by the Owner, it shall be considered full and final, including, but not limited to, all direct, indirect and impact costs associated with such change and any and all adjustments to the Contract Sum and the Construction Schedule..

§ 7.3.6.4 No additional time will be granted to the Contractor for minor Change Orders unless each individual Change Order totals more than \$100,000.

§ 7.3.6.5 Where they apply, unit prices for additions or deductions as stated in the Contract Documents shall always be used as the basis for determining the cost or credit to the Owner for any changes made no matter what the overall method is used for such determination.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

Init.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.3.11 If the Contractor claims that certain Work constitutes an addition, deletion, or change to the Work, the Contractor shall notify the Owner and Architect at least fourteen (14) days before proceeding with such Work, or else any claim by the Contractor for any adjustment to the Contract Sum or the Contract Time on account thereon shall be deemed waived.

- .1 If the Contractor gives timely notice and the Owner directs the Contractor to proceed with such disputed Work as part of its Work or as a minor change in the Work, the Contractor shall promptly proceed with such disputed Work, subject to later resolution in accord with the requirements of the Contract Documents.
- .2 In that event, the Contractor shall present, at the end of each day that the Contractor performed the disputed Work, a summary of the day's costs attributable to the disputed work, including labor hours and material costs, for verification by the Owner and the Architect.
- .3 Only the costs as verified by the Owner and Architect shall be used in computing any increase in costs for the purposes of the adjustment to the Contract Sum, should it later be determined that the Contractor is entitled to such adjustment.
- .4 Upon request, the Contractor shall provide to the Owner and Architect full supporting documentation for all costs claimed.
- .5 If and to the extent that the Contractor fails to submit such summary each day, its claim for an adjustment to the Contract Sum shall be deemed waived.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. Such changes will be effected by written order signed by the Architect and shall be binding on the Contractor. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

Init.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time. Contractor agrees to increase manpower, increase work hours, and to increase equipment necessary to maintain the Project Construction Schedule, and when also requested by the Architect and the Owner, and shall be without additional cost or charge to the Owner. Should it become apparent from the current Schedule that the Work will not be completed within the Contract Time, the Contractor agrees that he will, as necessary, take some or all of the following actions at no additional cost to the Owner to improve the progress of the Project:

§ 8.2.4 Work shall commence within ten (10) days of the issuance by Owner of a Notice to Proceed and shall proceed uninterrupted to Final Completion. The Contractor acknowledges and recognizes that the Owner is entitled to full and beneficial occupancy and use of all or part of the completed Work in accordance with the Milestone Dates set forth in other sections of the Contract Documents, as per approved Schedule, and that the Owner has made arrangements to discharge its public obligations based upon the Contractor's achieving Substantial Completion of all of the Work within the Contract Time. The Contractor further acknowledges and agrees that if the Contractor fails to complete substantially or cause the Substantial Completion of any portion of the Work, as required by the Project Construction Schedule and/or within the Contract Time, the Owner will sustain extensive damages and serious loss as a result of such failure. The exact amount of such damages will be extremely difficult to ascertain. Therefore, the Owner and the Contractor agree as set forth (below):

- .1 Increase manpower in such quantities and crafts as will substantially eliminate, in the judgment of the Architect, the backlog of Work;
- .2 Increase the number of working hours per shift, shifts per working day, working days per week, the amount of equipment, or any combination of the foregoing, sufficiently to substantially eliminate, in the judgment of the Architect, the backlog of Work; and/or

§ 8.2.5 Adherence to Schedule

- .1 The Owner reserves the right to withhold monthly progress payments if the Contractor is behind schedule, unless the Contractor documents, in writing, any delays that are not the fault of the Contractor and to which the Owner and Architect agree.
- .2 Monthly progress payments will only be released after the Contractor reaches the status of completion for that month contemplated by the Construction Schedule.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and litigation; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

- .1 Any direct claim against the Owner for delay costs caused by another Prime Contractor shall be subject to the provisions of Section 8.3.3

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

.1 Any claim for extension of time should be made in writing to the Architect not more than five (5) days after the commencement of the delay, otherwise, it shall be waived. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the work. No claim made beyond the five (5) days shall be considered valid.

.2 The Contractor agrees that if any delay in the Contractor's works unnecessarily delays the work of any other Contractor or Contractors, the Contractor shall in that case pay, or reimburse the Owner through a credit change

Init.

order, all costs and expenses incurred by such parties due to such delays and hereby authorizes the Owner to deduct the amount of such costs and expenses from any moneys due or to become due the Contractor under this Contract.

The Architect shall be responsible for ascertaining whether the Contractor is responsible for delaying any of the work of any other Contractor. His decision shall be final.

.3 The Contractor agrees that the Owner can deduct from the Contract Sum, any wages paid by the Owner to any Inspector or Architect or other professional necessarily employed by the Owner for any number of days in excess of the number of days allowed in the specifications for completion of work.

§ 8.3.3 No payment shall be made by the Owner to the Contractor as compensation for damages for any delays or hindrances from any cause whatsoever in the progress of the Work, notwithstanding whether such delays are avoidable or unavoidable. The Contractor's sole remedy for delays shall be an extension of time only, pursuant to and only in accordance with Section 8.3. Such extension shall be a period equivalent to the time lost by reason of and all of the aforesaid causes. In no event shall the Owner or Architect be held responsible for any loss or damage or increased costs sustained by the Contractor through any delays caused by the Owner or Architect or any other Prime Contractor. If, contrary to the foregoing provision, the Contractor commences a direct action against the Owner or Architect seeking to recover delay costs and fails to substantially prevail in its claim that the Owner was the cause of the alleged delay, the Contractor shall reimburse the Owner and the Architect as the case may be for any attorneys' fees, professional fees and all other costs and expenses incurred by them associated with analyzing, defending or otherwise opposing any such action; provided, however, that where the delay alleged by the Contractor arises from acts, omissions, or default of another Prime Contractor or another Prime's Subcontractors and Suppliers, then the provisions of Section 8.3.1 shall apply.

- .1 Where the cause of the delay is due to weather conditions, extension of time shall be granted only for unusually severe weather, as determined by reference to historical data. The term "historical data" as used in the preceding sentence shall be construed according to this formula: Average rainfall (or snow or low temperature) for the past five years for the month in question, plus 10 percent. Weather shall not be deemed to be unusually severe unless it is more than 10 percent more severe for that month over the last five years.

§ 8.3.4 The Contractor is required to submit at any construction conference considering any claim and at any proceeding considering an extension of time, and in all subsequent administrative proceedings, all files, records, and the documents of whatever kind pertaining to the Contractor's performance of the project work, the job budget, the summary of all supporting data worksheets and other documents prepared in connection with the submittal of the Contractor's successful bid.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted. The increased contract unit price shall not apply to quantities scheduled under the contract for delivery before the effective date of the increased contract unit price, unless failure to deliver before that date results from causes beyond the reasonable control and without the fault or negligence of the Contractor.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.2.1 Contractor must provide draft copies of the Schedule of Values, within fifteen (15) days from the Notice to Proceed. Submit two (2) copies to the Architect.

Init.

- .1 Schedule of Values shall include cost of work at the/each Building and for the/each Project and shall include the Architect's Special Project Number. Schedule of Values shall include materials and installation and in accordance with each Specification Section as listed in the Specification Index, as shown on the Drawings and/or as directed by the Architect. Contractor shall include separate line items for the following:
 - .1 Bonds,
 - .2 Insurance,
 - .3 Mobilization,
 - .4 General Conditions,
 - .5 Contractor's Construction Schedule,
 - .6 Submittals (Product Data, Samples, and Shop Drawings),
 - .7 As-Built Drawings and similar requirements as per Section for Closeout Documents,
 - .8 Punch List items and Closeout Documents per Section for Closeout Documents,
 - .9 Final Cleaning,
 - .10 Other items, as directed by the Architect.
- .2 Contractor shall enclose with the Schedule of Values, copies of invoices and/or cancelled checks from Bonding and Insurance Agents for the required cost of the coverage for the project being billed.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers and shall reflect retainage if provided for in the Contract Documents. The application for payment shall be on approved AIA G702 Forms and shall be accompanied by a partial waiver of liens in a form acceptable to the Owner and Architect.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.2.1 To encourage early purchase, Owner may pay for stored materials and equipment. The following procedures must be followed in order to obtain payment.

- .1 A certificate of insurance naming the Owner as loss beneficiary for the full dollar amount representing the materials stored.
- .2 A Consent of Surety in the amount being requisitioned, said Surety being the Bonding Company of the Prime Contractor.
- .3 Materials to be stored in warehouse must be inspected by the Architect/Engineer and the Contractor will not receive extra compensation for storage costs.
- .4 Any time and travelling expenses for the Construction Inspector to visit and inspect equipment stored will be borne by the Contractor making the off-site storage request.
- .5 Payment invoices for materials stored off site shall be so noted.
- .6 After the receipt of the above, the Construction Inspector will endorse same and forward to the Owner for their approval.
- .7 Payment invoices not following the above format will be rejected in total.
- .8 There will be no storage space available in the existing building(s). Space in new building(s) may be used

for storage only if approved, in writing, by the Architect/Engineer and all Contractors having work in the area.

- .9 The Contractor will be paid for storage materials no more than the actual or replacement value of the materials. The Contractor will furnish vendors price lists, priced inventories or other documentation to support claims for payment of materials stored on or off site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief such Architect would have had if they had conducted a diligent inquiry into the subject matter, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.3.4 The Owner reserves the right to settle any disputed mechanic's or materialmen's lien claim by payments to the lien claimant or by such other means as the Owner, in its sole discretion, determines is the most economical or advantageous method of settling the dispute. The Contractor shall promptly reimburse the Owner, upon demand, for any payments so made.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

Init.

- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.
- .8 deliberate delay in the submission for approval of names of Subcontractors, Materialmen, sources of supply, product data, shop drawings and samples;
- .9 otherwise failing to comply with the requirements of the Contract Documents; or
- 10. avoidable delay in the progress of the Work.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

- .1 If the Contractor disputes any determination by the Architect with regard to any Certificate of Payment, the Contractor nevertheless expeditiously shall continue to prosecute the Work.
- .2 The failure of the Owner to retain any percentage payable to the Contractor or any change in or variation of the time, method or condition of payments to the Contractor shall not release or discharge to any extent whatsoever, the Surety upon any bond given by the Contractor hereunder. The Owner shall have the right, but not the duty, to disregard any schedule of items and costs that the Contractor may have furnished and defer or withhold in whole or in part any payment if it appears to the Owner, in its sole discretion, that the balance available in the Contract Sum as adjusted and less retained percentages, may be insufficient to complete the Work.
- .3 Notwithstanding any provision of any law to the contrary, the Contractor agrees that the time and conditions for payment under the Contract for Construction shall be as stated in the Contract for Construction and in the Contract Documents. The Contractor specifically agrees that the Owner's failure to give, or timely give notice of:
 - .1 any error in an invoice or application for payment submitted by the Contractor for payment; or
 - .2 any deficiency or non-compliance with the Contract Documents with respect to any Work for which payment is requested, shall not waive or limit any of the Owner's rights or defenses under the Contract for Construction and the Contract Documents, or require the Owner to make a payment in advance of the time, or in an amount greater than, as provided by the Contract for Construction.
- .4 The Contractor shall make payments to its Subcontractors in accordance with the provisions of any applicable law governing the time, conditions, or requirements for payment to its Subcontractors, and shall comply with the provisions of any such law.
 - .1 The Contractor will pay its Subcontractors no later than fifteen (15) days after receipt of a payment from the Owner which includes payment for the Work of any such Subcontractors.
 - .2 The Contractor shall require its Subcontractors, by appropriate agreement, to pay their Subcontractors and Suppliers (of any tier) within the same time.
 - .3 The Contractor and its Surety shall indemnify and defend the Owner any loss, cost, expenses, or damages, including Attorney's fees arising from or relating to the Contractor's failure to comply with such law.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to

the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.7.1 If the Owner is entitled to any reimbursement or payment from the Contractor under or pursuant to the Contract Documents, such payment shall be made promptly upon demand by the Owner. Unless otherwise stated in the Contract Documents, if the Contractor fails to promptly make any payment due the Owner, or the Owner incurs any expenses to cure any default of the Contractor, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to: (1) deduct an amount equal to that which the Owner is entitled from any payment due the Contractor, or (2) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

- .1 Owner's beneficial occupancy must be approved by all governing authorities having jurisdiction and by issuance of a temporary or permanent "Certificate of Occupancy" and in accordance with all applicable Codes and Regulations.
- .2 Substantial Completion occurs when each of the following conditions precedent has occurred:
 - .1 the Work has been sufficiently completed in accordance with Contract Documents so that the Owner obtains beneficial use and occupancy of the Work;
 - .2 Certificates of Occupancy and any other permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial occupancy of the Project have been received by the Owner; and
 - .3 the Architect has issued a certificate of Substantial Completion. The date of Substantial Completion is the date certified by the Architect in accord with the Contract Documents and shall follow the Contractor's Notification for Substantial Completion inspection and the Architect's inspection of the Project.

§ 9.8.2 Unless otherwise indicated in the Contract Documents, no later than thirty (30) calendar days, prior to the date scheduled for Substantial Completion, the Contractor shall prepare and submit to the Architect and Owner, a comprehensive punch list of items remaining to be completed or corrected.

- .1 No later than ten (10) calendar days prior to the date for Substantial Completion, the Architect and/or Owner may add additional items requiring completion or correction.
- .2 The Contractor shall immediately proceed with the Work required by the punch list and shall complete and correct items on or added thereto by the date scheduled for Substantial Completion.
- .3 When the Contractor determines that the Work has reached Substantial Completion, or when the Owner, Architect so determine and direct the Contractor to do so, the Contractor shall request the Architect's final inspection to determine Substantial Completion. In addition, the Contractor shall prepare and submit to the Architect and Owner its final Application for Payment submitted in compliance with the requirements of the Contract Documents and shall thoroughly reinspect the Work; prepare and submit to the Architect and Owner a comprehensive final punch list of any and all items remaining to be completed or corrected (whether or not included on any previous punch list).
 - .1 Within fourteen (14) calendar days after receipt of the Contractor's request and final punch list, the Architect will inspect the Work to determine whether Substantial Completion has occurred.
 - .2 If the Architect determines that Substantial Completion has not occurred, it shall advise the Contractor and the Owner of the reasons for their determination and the Contractor shall continue with the Work and request another inspection for Substantial Completion and submit another final punch list after the concerns of the Architect have been addressed.
 - .1 The fees and expenses incurred by the Owner for services of the Architect as a result of any additional re-inspections of the Work, shall be paid by the Contractor or its Surety.
 - .3 When the Architect determines after an inspection under this Section that Substantial Completion has occurred the Architect shall:
 - .1 add to the Contractor's final punch list any additional items which they discover which also need to be completed or corrected;
 - .2 determine and certify the amount required to complete each item on the punch list, basing such determination upon the amount the Owner would have to expend or incur to complete each item if the Contractor failed to do so; and
 - .3 prepare and issue a certificate of Substantial Completion, which shall establish the date of Substantial Completion.
- .4 The Contractor shall proceed promptly to complete and correct items on the final punch list within thirty (30) calendar days of the date of Substantial Completion or prior date established for Final Completion in other sections of the Contract Documents.
- .5 Upon completion of correction of the punch list items, the Contractor shall submit to the Architect a copy of the punch list document, with each item individually initialed, indicating the Contractor's addressing of each item on a line-by-line or point-by-point basis.
- .6 Warranties required by the Contract Documents shall commence on the approved date of Substantial Completion of the Work for the entire project unless otherwise provided in the Certificate of Substantial Completion.
- .7 The Architect shall submit the Certificate of Substantial Completion to the Owner and Contractor. If not completed within this time, the Owner may proceed to finish the Work as otherwise provided in this Agreement.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents, nor does it waive the Owner's right to Liquidated Damages. Final Acceptance of the Work shall be for the whole Work only and not part.

§ 9.9.4 As portions of the Project are completed and occupied, the Contractor shall ensure the continuing construction activity will not unreasonably interfere with the use, occupancy and quiet enjoyment of the completed portions thereof.

- .1 The Contractor agrees to coordinate the Work with the Architect and the Owner in order to minimize disturbance to occupied portions of the structure.
- .2 In the event performances or scheduled events by the Owner are conducted in close proximity to the Work in progress, the Contractor agrees to cease all Work which may disturb the Owner's occupants at the site.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, such Architect would have had if they had conducted a diligent inquiring into the subject matter, and on the

basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

- .1 If more than one inspection for Final Completion is required, the Contractor will be billed and responsible for the professional fees and services of the Architect through a credit change order to the Owner.
- .2 Following Substantial Completion, in the event the Contractor or their Subcontractor fails to complete the list of items of the Work instructed by the Architect to be corrected or completed within fourteen (14) days after the date of receipt of Certificate of Substantial Completion, the Owner may:
 - .1 exercise any available remedies to correct or complete deficient work or retain a third party to correct or complete such work at the cost of the defaulting Contractor; and
 - .2 retain and deduct from any payments or retention otherwise due to the defaulting Contractor any fees and expenses for services required to be provided by the Architect more than twenty-one (21) days after the Date of Substantial Completion.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

- .1 The General Contractor (and/or assigned Lead Contractor) shall provide all necessary temporary enclosures, guardrails, barricades, etc., to adequately protect all workers and public from possible injury subject to Section 10.1.1.2 (below).
- .2 The General Contractor (and/or assigned Lead Contractor) shall be responsible for the general safeguarding of the Project, for gaining compliance with the safety requirements from all other Contractors and parties engaged in operations at the site and shall act as the Project Site Representative with regard to all safety inspections required and shall perform all necessary functions for this purpose.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .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 the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the 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.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, 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 the owners and users of adjacent sites and utilities of the safeguards.

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

§ 10.2.5 The 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 Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-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 Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's 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 Owner and Architect. The Contractor shall immediately report all accidents, injuries, or health hazards to the Owner, or his designated representative, in writing. This shall not obviate any mandatory reporting under the provisions of the Occupational Safety and Health Administration Act of 1970.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.2.9 Lost or Stolen Materials

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§ 10.2.9.1 The Contractor shall protect all materials and equipment and equipment for which he/she is responsible, which is stored at the Project Site for incorporation in the Work, or which has been incorporated into the Work. He/She shall replace at his/her expense all such materials and equipment which may be lost, stolen or damaged, whether or not such materials or equipment have been entirely or partially paid for by the Owner.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents, for claims caused in whole or in part by the Contractor's alleged negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

- .1 Certificate of insurance shall be submitted within ten (10) business days upon notification of award of Contract.
- .2 The Contractor may carry whatever additional insurance he/she deems necessary to protect himself/herself against hazards not covered by the Owner's Property Insurance, including coverage for theft, collapse, water damage, materials and equipment stored on the site, and for materials and equipment stored off site, and against loss of owned or rented capital equipment and tools owned by mechanics or any tools, equipment, scaffolding, staging, towers and forms owned or rented by the Contractor, the capital value of which is not included in the cost of the work. The Owner's "All Risk" Insurance does not cover theft of materials unless installed and made an integral part of the building. This loss must be assumed by the Contractor.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 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 authorize a copy to be furnished.

§ 11.1.4 **Notice of Cancellation or Expiration of Contractor's Required Insurance.** Within five (5) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

- .1 The Property Insurance obtained by the Owner shall include collapse and water damage, to the extent covered by the Owner's "All Risk" insurance.
- .2 The Owner agrees to be responsible for losses not covered by Property Insurance due to statutory deductible provisions.
- .3 The fact that the Owner is furnishing Property Insurance shall not be interpreted to relieve the Contractor of his/her obligation to complete the work without additional cost to the Owner beyond the Contract amount, except as provided in Section 11.2.1.2 (above).

§ 11.2.2 **Failure to Purchase Required Property Insurance.** If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the

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failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's Consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, shall require Subcontractors to make payments to their Sub-s Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from

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receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, such costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, the costs of uncovering and correction of the Work, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5. The Contractor shall bear all costs of correcting any and all Work not complying with this warranty, and the Contractor and its Surety shall indemnify the Owner for all costs, expenses, losses, and/or damages incurred by the Owner, including Attorney's fees, additional testing and inspections and compensation for the services and expenses of the Architect made necessary thereby. This warranty is in addition to any other warranty or remedy provided elsewhere in the Contract Documents and shall survive the expiration of any such other warranty, acceptance of a final payment for the Work, and the termination of the Contract for Construction.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

§ 12.3.1 The Contractor and its Surety guarantee to make good, repair and/or correct, at no cost or expense to the Owner, any and all latent defects hereafter discovered, provided only that notice in writing, shall be given by the Owner to the Contractor within one (1) year of the discovery of such defects.

- .1 This obligation shall survive the termination of any or all other obligation or obligations under the Contract Documents and it is agreed by the Contractor and its Surety that in the event the Owner is required to bring suit under this provision against the Contractor or its Surety to enforce this obligation, the Contractor and its Surety hereby waive any defense of the status of limitations.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

- .1 Contractor must comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities, utility companies, National Board of Fire Underwriters, and others which bear on performance of Work. Deliver to the Owner, certificates and other required legal evidence and proof of compliance with the above.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Unless otherwise required by the Contract Documents and related documents, the Owner will pay no interest whatsoever on any payments due.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, their agents or employees, or any other persons performing portions of the

Work

(Paragraph Deleted)

under contract with the Contractor

(Paragraphs Deleted)

because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work or under any order of any Court or other public authority having jurisdiction, the Contractor may, upon seven (7) additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of breach of a provision of the Contract Documents.
- .5 fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with the requirements of the Contract Documents;
- .6 fails after commencement of the Work to proceed continuously with the construction and completion of the Work for more than ten (10) days, except as permitted under the Contract Documents;
- .7 the bankruptcy or insolvency of a general assignment for the benefit of creditors by Contractor or by any of Contractor's principals, partners, officers, or directors; or
- .8 the indictment or government seizure of assets of Contractor or any of Contractor's principals, partners, officers, or directors.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the costs of finishing the Work, including compensation for the services of any Consultants and the Architect's services and expenses made necessary thereby, and the other costs and expenses identified hereinafter, exceed the unpaid balance of the Contract Sum, the Contractor and its Surety shall pay the difference to the Owner upon demand. The costs of finishing the Work include, without limitation, all reasonable Attorney's fees, additional title costs, insurance, additional interest because of any delay in completing the Work, and all other direct and indirect consequential costs, including, without limitation, Liquidated Damages for untimely completion as specified in the Contract Documents, incurred by the Owner by reason of, or arising from, or relating to the termination of the Contractor as stated herein.

§ 14.3 Suspension by the Owner for Convenience

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

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. 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 the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

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

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work performed as of the date of termination in accordance with the Contract Documents. The Contractor shall, as a condition of receiving the payment(s) referred to herein, execute and deliver all such papers, turn over all plans, documents and files of whatsoever nature required by the Owner and take all such steps, including the legal assignment of its contractual rights, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor. The Contractor warrants that it will enter into no subcontracts or other agreements that would adversely impact the Owner's rights or increase the Owner's obligations under this Section. In no event shall the Owner be liable to the Contractor for lost or anticipated profits or consequential damages, or for any amount in excess of the compensation due to the Contractor in accord with the Contract Documents for the Work performed as of the date of termination. The warranty and indemnity obligations of the Contractor and Surety shall survive and continue, notwithstanding and termination pursuant to this Section, with respect to the Work performed as of the date of termination.

§ 14.4.4 If the Owner wrongfully terminates the Contract for Construction for cause, the termination shall be deemed to have been one for convenience under this Article 14.4, and the Contractor shall receive from the Owner only the compensation to which the Contractor is entitled under Subparagraph 14.4.3.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 15.1.2.

- .1** No act or omission by the Owner or Architect, or by anyone acting on behalf of either shall be deemed or construed as a waiver or limitation of any right or remedy under the Contract Documents, or as an admission, acceptance, or approval with respect to any breach of the Contract for Construction or failure to comply with the Contract Documents by the Contractor, unless the Owner expressly agrees, in writing.
- .2** The Owner's exercise, or failure to exercise any rights, claims or remedies it may have arising out of or relating to the C9.8.ontract Documents shall not release, prejudice, or discharge the Owner's other rights and remedies, nor shall it give rise to any right, claim, remedy or defense by any other person, including the Contractor, its Surety, any Subcontractor, or any other person or entity.
- .3** Whenever possible, each provision of the Contract Documents shall be interpreted in a manner as to be effective and valid under applicable law. If, however, any provision of the Contract Documents, or portion thereof, is prohibited or found invalid by law, only such invalid provision or portion thereof shall be ineffective and shall not invalidate or affect the remaining provision of the Contract Documents or valid portions of such provision, which shall be deemed severable.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

- .1** The Owner has the responsibility to make a claim as promptly as is reasonably possible after recognizing or receiving notice of a condition which gives the basis or reason for such a claim.

- .2 The Contractor must provide notice of a claim prior to the submission of a payment requisition, not later than the submission of the second payment requisition following the date the Contractor knew or should have known of the condition giving rise to the claim.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments that are due and owing, and not in dispute, in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4. If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the owner, (6) Owner's suspension or (7) other reasonable grounds, the Claim shall be filed in accordance with the procedure established herein. Failure to file a Claim in accordance with this Paragraph shall constitute a waiver thereof.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary. All claims for additional time shall be accompanied by a Time Impact Analysis for justification.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial

Init.

decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement, a retired Judge of the Superior Court of New Jersey mutually agreed to by the parties. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made

concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration, a binding dispute resolution is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

(Paragraph Deleted)

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 All questions in dispute between the Owner and the Contractor shall be determined by the Courts having jurisdiction of the subject matter, and neither party shall submit to arbitration by

(Paragraphs Deleted)

the American Arbitration Association or any other arbitration agency. Jurisdiction in this matter shall be with the Superior Court of New Jersey; New Jersey law shall apply.

SECTION 00800 - SUPPLEMENTARY GENERAL CONDITIONS

1.1 GENERAL

- A. The following Supplementary General Conditions supplement, modify, change, delete from or add to the "General Conditions of the Contract for Construction," AIA Document A201, 2017 ("**General Conditions**"). Where any Article of the General Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect. These Supplementary General Conditions take precedence over any conflicting provisions in the General Conditions.
- B. Refer to other Sections in Division 1 "General Requirements" for additional modifications, deletions and additions to the "General Conditions of the Contract for Construction."

1.2 ARTICLE 2 OWNER

- A. PARAGRAPH 2.2 - INFORMATION AND SERVICES REQUIRED OF THE OWNER:

Insert the following paragraph:

2.2.1 The Architect will furnish the contractor, without charge, the following number of sets of drawings and specifications. Additional copies will be furnished at the Architect's reproduction costs.

Single Overall Contract - 3 Sets

1.3 ARTICLE 3 CONTRACTOR

- A. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

Supplement subparagraph 3.12 as following:

3.12.11 Contractor shall provide separate submittals for each Project with reference to Architect's Project Number. Contractor, within ten (10) days of the Award Notice, shall submit to the Architect a written submittal log including all of the following requirements:

- .1 A list of all required submission items grouped by technical section in each division number as set forth in the specifications,
- .2 Dates upon which each submission will be made by the Contractor and the date by which the contractor expects same to be returned to him by the Architect, allowing a reasonable time for review,

- .3 Critical items and long lead items shall be so noted on the log,
- .4 A sequence of submissions reasonably based upon the expected progress of the Project,
- .5 Submittals will be mandatory and shall meet time requirements established in other sections of the Contract Documents.

3.12.12 The Architect may request samples of any or all materials to be used in the work. When requested, samples shall be submitted promptly.

3.12.13 Shop drawings and other data where possible shall be submitted in the form of reproducible transparency. Catalogs and other printed matter shall be submitted in six (6) copies. Contractor shall provide submittals, (Shop drawings), for all fabricated items.

- .1 Additional prints for file, distribution and for coordination of the work with other contractors shall be provided as directed or as required.

3.12.14 Submittal Procedures: The Contractor's failure to follow proper procedures for submittals constitutes grounds for withholding of payments until such time as the Contractor is in compliance. Proper submittal procedures include all of those set forth elsewhere in this specification including but are not limited to the following:

- .1 Failure to adhere to deadlines for completion of submittals and record/resubmittals.
- .2 Failure to provide submittals in good order as required by the Contract Documents.
- .3 Failure to provide submittals in relationship to the progress of the work.
- .4 Performance of work or part of the work, without complete approved submittals.

3.12.15 Architect / Engineer's actions for submittals shall be as follows:

- .1 Submittals returned to the Contractor marked "Approved" allow the Contractor to proceed with the work.
- .2 Submittals returned to the Contractor "Approved As Noted"; "Resubmit For Record":
 - .1 The Contractor may proceed with work, however noted items by the Architect / Engineer (or any affected portion of the submittal), must be corrected and resubmitted to the Architect's office within ten (10) working days of contractor's receipt of the original submittal. Final

acceptance of all work is subject to the Contractor's compliance with requirements of the Contract Documents.

- .3 Submittals returned marked "Returned for Corrections" require the Contractor to resubmit corrected or alternate data in accordance with the corrections indicated.
 - .1 The originals of the reproducible transparencies marked "Returned for Corrections" shall be corrected until approval is obtained. The Contractor shall provide such number of prints of transparencies marked "Approved" as required for the expeditious execution of the work.
- .4 Submittals returned marked "No Action Taken":
 - .1 The Contractor may not proceed with the work. The Architect / Engineer will not review submittals so marked until the Contractor has properly completed the submittal or corrected the reasons stated thereon.
 - .2 Reasons for "No Action Taken" on a submittal include, but are not limited to the Contractor's failure to:
 - .1 Submit an approved sub-contractor or supplier.
 - .2 Indicate job specific product data such as catalog number, size, type or material on each submittal.
 - .3 Submit complete data, test reports or similar information as required by the Contract Documents.
 - .4 Obtain prior approval for substitution.
 - .5 Submit documents in a legible or orderly fashion.
 - .6 Adhere to any submittal requirements set forth in the Contract Document.
 - .7 Submit only submittals which are called for in the Contract Documents, other submittals will not be reviewed by the Architect / Engineer.

3.12.16 Request for Substitutions:

- .1 Unless otherwise indicated in the Contract Documents, substitutions may be considered after the award of Contracts. Subsequent requests will be considered only when, through no fault of the Contractor, none of the specified products are available.
- .2 Submission of request for substitution shall constitute a representation by the Contractor that he:
 - .1 Has investigated the proposed product and determined that it is equal to or better than the specified product.
 - .2 Will provide the same variety for the proposed product as for the specified product.

- .3 Will coordinate the installation and make other changes which may be required for the work to be complete in all respects, including:
 - .1 Re-design.
 - .2 Additional components and capacity required by other work affected by the change.
 - .3 Waives all claims for additional costs and time extensions which subsequently may become apparent and which are caused by the change.
- .4 Substitutions will not be considered when acceptance would require substantial revision of the contract documents.
- .5 Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals without separate written request.
- .6 Substitution requests will not be considered when submitted directly by subcontractor or supplier.
- .7 When the proposed substitution is not accepted, Contractor(s) must provide the product (or one of the products, as the case may be) specified.
- .8 The Contractor will be notified in writing within a reasonable time, verbal acceptance will not be valid.
- .9 Acceptable substitutions will be added to the contract documents by appropriate modifications.
- .10 Requests for substitution will be reviewed by the Architect/ Engineer upon receipt of all the information requested in the following paragraph. Failure to provide the required information shall be cause for rejection of substitution request.
- .11 Submittal for Substitutions:
 - .1 The Contractor shall begin the submission process as soon as possible after the Award Notice, but in no event later than fifteen (15) days after Notice to Proceed.
 - .2 The Contractor shall sequence and time his submissions in a reasonable and orderly fashion. He will allow for sufficient time for the Architect's review as well as the transmission of same amongst all project participants.
 - .3 In the case of color selections, the Contractor is responsible for the completion of all required and related submissions, including samples, prior to the Owner's selection of colors. Exceptions can be made for certain long lead items so identified on the submittal log.
 - .4 The Contractor shall complete the entire submission process as soon as possible but in no event later than thirty (30) days after Notice to

Proceed, unless otherwise authorized by the Architect, Engineer and/or the Owner.

- .1 Exceptions may be made if so noted on the submission log, with good reason, and subject to the Architect's / Engineer's approval.
- .2 Upon receipt by the Architect, he will review same and advise the Contractor if the log is acceptable.
- .3 At no time will the Contractor unduly burden the Architect/Engineer with excessive or unreasonable submittals made at one time.
- .4 In advertent omission of any required submittal item from the log does not relieve the Contractor of his obligation to make timely submissions of same. The Contractor shall keep his submission log up to date at all times. He will provide an updated copy to the Architect, at any time, upon request.
- .5 Submit three (3) copies of requests for substitutions, fully identified for product, material or method being replaced by substitution, including related specification section and drawing number(s), and fully documented to show compliance with requirements for substitutions. Submit the following:
 - .1 Complete product data, drawings, and descriptions of materials and methods where applicable. Provide manufacturer's name and address, trade name, and model number of product (if applicable), and name of fabricator or supplier (if applicable).
 - .2 Samples where applicable or requested.
 - .3 Detailed comparison of significant qualities (size, weight, durability, performance and similar characteristics, and including visual effect where applicable) for proposed substitution in comparison with original requirements.
 - .4 List, with addresses, of 3 projects where proposed substitution has been used previously and successfully in a similar application.
 - .5 Coordination information, indicating every required change in every other element of the work which is affected by substitution, extended to include work by Owner and separate Contractors.
 - .6 A complete statement of effect substitution will have upon schedule of the work, including its effect (if any) on Contract Time (in comparison with compliance with requirements without approval of proposed substitution).
 - .7 Cost information, including a proposal of net change in Contract Sum (if any).
 - .8 Certification by Contractor to the effect that, in his opinion and after his thorough evaluation, proposed substitution will result in total work which is equal to or better than the work originally required by contract documents, in every respect of significance except as specifically stated in certification;

and that it will perform adequately in application indicated, regardless of equality and exceptions thereto.

- .9 Include in certification, Contractor's waiver of rights to additional payment and time which may subsequently be necessitated, by failure of substitution to perform adequately and for required work to make corrections thereof.

3.12.17 Approval of Substitutions:

- .1 Requests for substitution will be reviewed for compliance with the specifications based upon the data provided by the Contractor. Approval or rejection will be based on samples, technical data and other items submitted and will be reviewed once and only once for each such request.
- .2 Change Order Form: Submit requests for substitutions which propose a change in either the Contract Sum or Contract Time by procedures required for change order proposals.

3.12.18 Long Lead Items:

- .1 In addition to and concurrent with the submission of the "Schedule of Values" as provided under Paragraph 9.2, Contractor shall submit a list of all materials, equipment or components which are anticipated to require more than four weeks delivery, together with scheduled ordering and delivery time table.
- .2 This will be discussed and reviewed regularly at the job meetings.
- .3 Upon request by the Architect / Engineer, the Contractor shall be prepared to produce evidence of having placed orders for specific materials, equipment and components.

1.4 ARTICLE 9 PAYMENTS AND COMPLETION

A.. Supplement subparagraph 9.6 "PROGRESS PAYMENTS" as follows:

9.6.8 Unless indicated otherwise in the Contract Documents, in making progress payments, on Contracts totaling more than \$100,000 dollars there shall be retained two percent (2%) of the approved amount when the outstanding balance of the contract exceeds \$500,000, and 5% of the amount due on each partial payment when the outstanding balance of the contract is \$500,000 or less, until final completion and acceptance of all work covered by the Contract, including the completion of all corrective or punch list items.

- .1 In making progress payments, on Contracts totaling less than \$100,000 dollars there shall be retained ten percent (10%) of the approved amount until seventy-five percent (75%) of the Contract Price has been paid at

which time the retainage for that seventy-five percent (75%) will be reduced to five percent (5%) if in the judgment of the Architect the work is progressing satisfactorily, and on progress payments thereafter there shall be retained ten percent (10%) of the approved amounts until final completion and acceptance of all work covered by the Contract, including the completion of all corrective or punch list items. The Contractor will be required to provide a Consent of Surety to Reduction in or Partial Release of Retainage (AIA Document G707A), before reduction in retainage will be considered.

9.6.9 Final payment will be made provided the work has been completed, the contract fully performed and a final certificate for payment has been issued by the Architect.

9.6.10 As required by N.J.S.A. 2A:30A-1, this is to inform you that as a governmental entity, the School District may require longer to make payment than 30 calendar days after receipt of your billing. As provided by law, payments that required a vote of authorization may be certified at the next scheduled public meeting and paid during the next subsequent payment cycle.

1.5 ARTICLE 11 INSURANCE AND BONDS

A. Supplement Subparagraph 11.1 CONTRACTOR'S LIABILITY INSURANCE as follows:

11.1.5 Certificate of insurance shall be submitted within ten (10) days upon notification of award of Contract.

11.1.6 Contractor's liability insurance must be maintained until the final Certificate of Payment is issued pursuant to Paragraph 9.10.1 and Completed Operations Insurance is in effect.

11.1.7 Insurance specified to be provided by the Contractor under Paragraph 11.1 shall be on an occurrence basis, as follows and as noted in AIA A101 - 2017, Exhibit A:

- .1 The Contractor shall take out and maintain during the life of this Contract commercial general liability insurance, covering any and all bodily injury, including accidental death, as well as claims for property damage arising out of or in connection with the Work performed hereunder, whether such Work be performed by the Contractor or by any subcontractor or by anyone directly or indirectly employed by either of them.
 - .1 The policy shall name the Owner, the Architect, and their consultants and agents and employees as additional insureds.
- .2 The Contractor shall take out and maintain comprehensive automobile liability insurance, including coverage for all owned, non-owned and hired vehicles, covering bodily injury and property damage.

- .1 The policy shall name the Owner, the Architect, and their consultants and agents and employees as additional insureds.
- .3 Contractual liability insurance as applicable to the Contractor's obligations under Paragraph 3.18 of the AIA General Conditions.
- .4 Completed Operations Insurance written to the limits specified for liability insurance specified AIA A101 - 2017, Exhibit A, Article A.3 - Contractor's Insurance and Bonds. Coverage shall be maintained for five (5) years from the date of the start of Beneficial Occupancy until after final payment or the then current applicable statute of repose.
- .5 Certificates of insurance must be submitted on the ACORD Form, Certificate of Insurance.
- .6 The Contractor shall either:
 - .1 require each of his/her subcontractors to procure and to maintain during the life of their subcontracts, Subcontractor's Public Liability and Property Damage, of the type and in the same amounts as specified in the preceding paragraph; **or**
 - .2 insure the activities of their subcontractors under their respective policies.

1.7 ARTICLE 13 MISCELLANEOUS PROVISIONS

- A. Delete Paragraph 13.6 "Interest" in its entirety.

1.8 ARTICLE 15 CLAIMS AND DISPUTES

- A. 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

- 15.1.6 Delete Section 15.1.6. in its entirety.

END OF SECTION 00800

SECTION 00850 - CONTRACT DRAWINGS

- 1.1 All Drawings listed on drawing No. G002, "General Notes, Drawing Index, Abbreviation," dated October 11, 2023, unless otherwise revised or amended (via Addenda, Bulletin, etc.), shall form a part of the Contract Documents.

END OF SECTION 00850

SECTION 00860 - LAWS GOVERNING PUBLIC WORK

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. The paragraphs below supplement the General Conditions. Attention is called, but not limited, to the following Laws Governing Public Work.

1.2 STATE SALES AND USE TAX EXEMPTION

- A. Supplement paragraph 3.6 "Taxes" as follows:

3.6.1 As a New Jersey governmental entity, the Board of Education is exempt from the requirements under New Jersey state sales and use tax (N.J.S.A. 54:32B-1 et seq.), and does not pay any sales or use taxes. Bidders should note that they are expected to comply with the provisions of said statute and the rules and regulations promulgated thereto to qualify them for examinations and reference to any and all labor, services, materials and supplies furnished to the Board of Education. Contractors may not use the Board's tax identification number to purchase supplies, materials, service or equipment, for this project.

.1 A contractor may qualify for a New Jersey Sales Tax Exemption on the purchase of materials, supplies and services when these purchases are used exclusively to fulfill the terms and conditions of the contract with the Board of Education. All contractors are referred to New Jersey Division of Taxation-Tax Bulletin S&U-3 and in particular, Contractor's Exempt Purchase Certificate (Form ST-13). Again, contractors are not permitted to use the Board's tax identification number to purchase supplies, materials, services of equipment.

1.3 MUNICIPAL REQUIREMENTS

- A. Supplement paragraph 3.7 "Permits, Fees, Notices and Compliance with Laws" as follows:

3.7.1.1 N.J.S.A. 52:27D-130, provides that local Municipal Construction Enforcing Agency issue required construction permit, perform required inspections during construction, and issue required certificate of occupancy upon completion of Project.

3.7.1.2 N.J.S.A. 52:27D-126C, "No county, municipality, or any agency or instrumentality thereof shall be required to pay any municipal fee or charge in order to secure a construction permit for the erection or alteration of any public building or part thereof from the municipality wherein the building may be located. No erection or alteration of any public building or part thereof by a county, municipality, school board, or any agency or instrumentality thereof shall be subject to any fee, including any surcharge or training fee, imposed by any department or agency of State government pursuant to any law, or rule or regulation, except that nothing contained

in this section shall be interpreted as preventing the imposition of a fee upon a board of education by either the Department of Education for plan review or by a municipality for the review of plans submitted to it pursuant to the provisions of section 12 of P.L.1975, c.217 (C.52:27D-130).

3.7.1.3 N.J.S.A. 40:55D-8(d), A municipality shall exempt a board of education from the payment of any fee related to land use, and site development.

3.7.1.4 N.J.S.A. § 52:27d-126e (amended effective July 21, 2017) - Waiving of Construction Permit, Enforcing Agency Fees for Certain Construction Projects To Benefit Disabled Persons.

1.a. Notwithstanding the provisions of the "State Uniform Construction Code Act," P.L. 1975, c.217 (C.52:27D-1 19 et seq.), or any rules, regulations or standards adopted pursuant thereto, to the contrary, the governing body of any municipality which has appointed an enforcing agency pursuant to the provisions of section 8 of P.L.1975, c.217 (C.52:27D-126) may, by ordinance, provide that no person shall be charged a construction permit surcharge fee or enforcing agency fee for any construction, reconstruction, alteration or improvement designed and undertaken solely to promote accessibility by disabled persons to an existing public or private structure or any of the facilities contained therein.

The ordinance may further provide that a disabled person, or a parent or sibling of a disabled person, shall not be required to pay any municipal fee or charge in order to secure a construction permit for any construction, reconstruction, alteration or improvement which promotes accessibility to his own living unit.

For the purposes of this subsection, "disabled person" means a person who has the total and permanent inability to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment, including blindness, and shall include, but not be limited to, any resident of this State who is disabled pursuant to the federal Social Security Act (42 U.S.C.416), or the federal Railroad Retirement Act of 1974 (45 U.S.C.231 et seq.), or is rated as having a 60% disability or higher pursuant to any federal law administered by the United States Veterans' Act. For purposes of this paragraph "blindness" means central visual acuity of 20/200 or less in the better eye with the use of a correcting lens. An eye which is accompanied by a limitation in the fields of vision such that the widest diameter of the visual field subtends an angle no greater than 20 degrees shall be considered as having a central visual acuity of 20/200 or less.

b. (1) Notwithstanding the provisions of the "State Uniform Construction Code Act," P.L. 1975, c.217 (C.52:27D-119 et seq.) or any rules, regulations or standards adopted pursuant thereto to the contrary, the governing body of any municipality which has appointed an enforcing agency pursuant to the provisions of section 8 of P.L. 1975, c.217 (C.52:27D-126) shall not charge a person who has a service-connected disability declared by the United States Department of

Veterans Affairs, or its successor, to be a total or 100% permanent disability that would entitle them to a property tax exemption under section 1 of P.L.1948, c.259 (C.54:4-3.30) or a spouse, parent sibling, or guardian of the disabled veteran, a construction permit surcharge fee or enforcing agency fee for any construction, reconstruction, alteration, or improvement designed and undertaken solely to promote accessibility by the disabled veteran to his own living unit.

(2) A municipality that has granted an exemption from a construction permit surcharge fee or enforcing agency fee pursuant to paragraph (1) of this subsection may apply to the Department of Community Affairs, in accordance with rules and regulations promulgated by the Commissioner of Community Affairs for this purpose, for reimbursement of those exempt fees.

- B. Utility Connection Fees: Contractors shall pay utility connection fees and shall be reimbursed by Owner upon presentation of receipt for same.
- C. Certificates of Occupancy: Contractors shall be responsible for obtaining all Certificates of Occupancy.

1.4 TIME INCLUDING COMPLETION

- A. Supplement Article 8 "Time" as follows:

8.1.7 The term "completed" in N.J.S.A. 18A:18A-19 shall mean substantial completion as defined in this Article 8.

8.1.8 The term "Working Days" as used to compute the time of completion shall mean Mondays through Fridays, exclusive of the twelve major yearly holidays, as listed on the official State of New Jersey website, <https://www.state.nj.us/nj/about/facts/holidays/>

- B. Supplement Article 8.3 "Delays and Extension of Time" as follows:

8.3.4 The Contractor agrees that the Owner can deduct from the Contract Price, any wages paid by the Owner to any Inspector or Inspectors necessarily employed by the Owner for any number of days in excess of the number of days allowed in the specifications for completion of the work.

1.5 NONDISCRIMINATION AND MISCELLANEOUS LABOR PROVISIONS

- A. Attention is called to the following which supplement paragraph 13.1 "Antidiscrimination Provisions" as follows:

13.1.3 N.J.S.A. 10:2-1, Antidiscrimination provisions. Every contract for or on behalf of the State or any county or municipality or other political subdivision of the State, or any agency of or authority created by any of the foregoing, for the construction,

alteration or repair of any public building or public work or for the acquisition of materials, equipment, supplies or services shall contain provisions by which the contractor agrees that:

- a. In the hiring of persons for the performance of work under this contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under this contract, no contractor, nor any person acting on behalf of such contractor or subcontractor, shall, by reason of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex, discriminate against any person who is qualified and available to perform the work to which the employment relates;
- b. No contractor, subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee engaged in the performance of work under this contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under such contract, on account of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex;
- c. There may be deducted from the amount payable to the contractor by the contracting public agency, under this contract, a penalty of \$50.00 for each person for each calendar day during which such person is discriminated against or intimidated in violation of the provisions of the contract; and
- d. This contract may be canceled or terminated by the contracting public agency, and all money due or to become due hereunder may be forfeited, for any violation of this section of the contract occurring after notice to the contractor from the contracting public agency of any prior violation of this section of the contract.

No provision in this section shall be construed to prevent a board of education from designating that a contract, subcontract or other means of procurement of goods, services, equipment or construction shall be awarded to a small business enterprise, minority business enterprise or a women's business enterprise pursuant to N.J.S.A. 18A:18A-51 et seq.

During the performance of this contract, the contractor agrees to Mandatory Equal Employment Opportunity Language, as shown Exhibit B.

13.1.3 N.J.S.A. 34:11-56.25 et seq., in accordance with which the Contractor(s) and subcontractor(s) are required to do the following:

- .1 Pay to all workers engaged in the performance of services directly upon the work not less than the prevailing rate of wages. In the event that it is found that any worker employed by the Contractor(s) or any subcontractor(s) has been paid a rate of wage less than the prevailing wage required to be paid by such contract, the Owner may terminate the contractor's right to proceed with the work or such part of the work as to which there has been a failure to pay required wages and

to prosecute the work to completion or otherwise.

- .1 Prime Contractor(s) shall post the New Jersey Department of Labor and Workforce Development - Prevailing Wage Rate Determination in accordance with N.J.S.A. 34:11-56.25 et seq., which establish and enforce a prevailing wage level for workers engaged in the project, based on the effective date where the contract(s) is/are to be awarded. This document is to be posted in a prominent and easily accessible place at the site of the work and at such a place or places as are used to pay workers their wages. The prevailing wage rates shall be incorporated into the bid specification manual as a reference and part of the contract. A copy of the project's prevailing wage rates, as applicable to this Project, are on file at the Architect's office.
- .2 Before final payment, furnish Owner with an Affidavit stating that all workers have been paid in accordance with the New Jersey Prevailing Wage Act.
- .3 Keep an accurate record showing the name, craft or trade and actual hourly rate of wages paid to each workman employed by him/her in connection with his/her work. Preserve records for 2 years from date of payment.
- .4 Upon request, the Contractor(s) and each Subcontractor shall file written statements certifying to the amounts then due and owing to any and all workers for wages due on account of the work. The statement shall set forth the names of the persons whose wages are unpaid and the amount due to each. These statements shall be verified by the oaths of the Contractor(s) or subcontractor(s), as the case may be.

1.6 AMERICANS WITH DISABILITIES ACT; FACILITIES FOR PERSONS WITH DISABILITIES

- A. The contractor must comply with all provisions of Title II of the Americans with Disabilities Act (ADA), P.L. 101-336, in accordance with 42 U.S.C. S121.01 et seq. The Board of Education further recognizes that all specifications for the construction, remodeling or renovation of any public building shall provide facilities for persons with disabilities. Reference: N.J.S.A. 18A:18A-17.
- B. It is further recommended that bidders are required to read the Americans with Disabilities language form that is included in these specifications. The form shall be signed to show agreement with the provisions of Title II of the Act and the provisions are to be made a part of the contract. The signed form shall be submitted with the bid proposal. The contractor is obligated to comply with the Act and to hold the owner harmless.

1.7 AMERICAN GOODS AND PRODUCTS

- A. Supplement Paragraph 13.1 "Governing Law" as follows:

13.1.5 N.J.S.A. 18A:18A-20 et seq., American goods and products to be used where possible. Each board of education shall provide as a condition of the Contract that only manufactured and farm products of the United States, where ever available, be used in the work.

1.8 PAYMENTS TO LISTED SUBCONTRACTORS UNDER SINGLE OVERALL CONTRACT

A. Supplement Paragraph 13.1 "Governing Law" as follows:

13.1.6 N.J.S.A. 18A:18A-18, providing that under a single overall contract, all payment required to be made for work and materials supplied by the various subcontractors shall, upon certification by the Prime Contractor of the amount due to the subcontractor(s), be paid directly to the subcontractor(s).

1.9 POLITICAL CONTRIBUTION DISCLOSURE FORM

A. In accordance with N.J.S.A. 19:44A-20.26 "pay to play," Contracts exceeding \$17,500.00 are not to be entered into with business entities unless certain disclosures are made about political contributions.

1. In accordance with N.J.S.A. 19:44A-20.26 Contractor shall be required to disclose political contributions made, if any, ten (10) days before entering into Contract in accordance with C.271 form. All bidders must complete this form and submit with Bid Proposal Forms.

B. In accordance with N.J.A.C. 6A:23A-6.3, No district board of education shall vote upon or award any contract in the amount of \$17,500 or greater to any business entity that has made a contribution reportable by the recipient under N.J.S.A. 19:44A-1 et seq., to a member of the district board of education during the preceding one-year period.

1. Contributions reportable by the recipient under N.J.S.A. 19:44A-1 et seq., to any member of the district board of education from any business entity doing business with the school district shall be prohibited during the term of a contract.

2. The disclosure requirement set forth in N.J.S.A. 19:44A-20.26 also shall apply when the contract is required by law to be publicly advertised for bids.

1.10 DISCLOSURE OF CONTRIBUTIONS TO NEW JERSEY ELECTION LAW ENFORCEMENT COMMISSION (ELEC)

A. N.J.S.A. 19:44A-20.27 establishes a new disclosure requirement for business entities. It requires that, when a business entity has received in any calendar year \$50,000 or more in public contracts with public entities, it must file an annual report with the Election Law Enforcement Commission (ELEC). The report shall disclose any contribution of money or any other thing of value, including an in-kind contribution, or pledge to make a contribution of any kind:

1. To a candidate for or the holder of any public office having ultimate responsibility for the awarding of public contracts, or,
 2. To a political party committee, legislative leadership committee, political committee or continuing political committee.
- B. The report will include all reportable contributions made by the business entity during the 12 months prior to the reporting deadline. ELEC will be promulgating a form and procedures for filing commencing in January 2007. ELEC can also impose fines for failure to comply with this requirement.
- C. While the local unit has no role in this process, it is recommended that all bid or proposal specifications and contracts should include language notifying business entities of their potential obligation under the law. Such language could read as follows:
1. Starting in January 2007, all business entities are advised of their responsibility to file an annual disclosure statement of political contributions with the New Jersey Election Law Enforcement Commission (ELEC) pursuant to N.J.S.A. 19:44A-20.27 if they receive contracts in excess of \$50,000 from public entities in a calendar year. Business entities are responsible for determining if filing is necessary. Additional information on this requirement is available from ELEC at 888-313-3532 or at www.elec.state.nj.us."

1.11 PROMPT PAYMENT ACT

- A. The Owner will issue timely payments to Contractors in accordance with the requirements of the Prompt Payment Act, N.J.S.A. 2A:30A-1, et seq. The bidders are hereby notified that the Owner as a public entity requires all payments to be approved at scheduled public board meetings. The vote on authorization for payments will be made at the first public meeting of the Board following the Board's receipt of the architect's authorization for payment and paid during the subsequent payment cycle.

1.12 NEW JERSEY DEPARTMENT OF TREASURY

- A. Disclosure of Investment Activities in Iran
1. Pursuant to Public Law 2012, c.25 (N.J.S.A.52:32-55, et. seq.), any person or entity ("bidder") that submits a bid or proposal or otherwise enters into or renews a contract with a board of education is required to disclose if it is engaged in investment activities in Iran. In order to comply with the provisions of P.L. 2012, c. 25, all bidders are required to complete a certification that attests that neither the bidder, nor any of its parents, subsidiaries and/or affiliates is listed on the list developed by the New Jersey Department of Treasury's List of Persons or Entities Engaging in Prohibited Investment Activities in Iran, pursuant to section 3 of P.L.2012, c. 25 (N.J.S.A. 52:32-57). The Department of Treasury List is available at <http://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf>.

A copy of the list is attached for informational purposes. All bidders are advised to refer to the most current version of the list to ensure compliance with P.L. 2012, c. 25.

2. If the bidder is unable to certify compliance with the law, the bidder shall provide a detailed and precise description of such investment activities as described in N.J.S.A. 52:32-56(f).
 3. If the board determines that a person or entity submits a false certification concerning its engagement in investment activities in Iran under N.J.S.A. 52:32-58, the board shall report to the New Jersey Attorney General the name of that person or entity. The Attorney General shall determine whether to bring a civil action against the person or entity to collect the penalty prescribed in N.J.S.A. 52:32-59.
- B. N.J.S. 18A:18A-49.4 Civil action brought on behalf of Board of Education.
1. 8.a. A Board of Education as defined in and subject to the provisions of the "Public School Contracts Law, N.J.S.A. 18A:18A-1 et seq., shall implement and comply with the provisions of P.L.2012, c.25 (C.52:32-55 et al.), except that the Board shall rely on the list developed by the State Department of the Treasury pursuant to N.J.S.A. 52:32-57.
 2. 8.b. If the Board determines that a person or entity has submitted a false certification concerning its engagement in investment activities in Iran under N.J.S.A. 52:32-58, the Board shall report to the New Jersey Attorney General the name of that person or entity, and the Attorney General shall determine whether to bring a civil action against the person to collect the penalty prescribed in N.J.S.A. 52:32-59. The Board may also report to the Board's attorney the name of that person, together with its information as to false certification, and the Board's attorney may determine to bring such civil action against the person to collect such penalty.
- C. N.J.S. 18A:18A-49.5 Board of Education, Compliance; Report of False Certification.
1. 3.a. A board of education as defined in and subject to the provisions of the "Public School Contracts Law," P.L.1977, c.114 (N.J.S. 18A:18A-1 et seq.), shall implement and comply with the provisions of P.L.2022, c.3 (C. 52:32-60.1 et al.), except that the board shall rely on the list developed by the Department of the Treasury pursuant to subsection b. of section 1 of P.L.2022, c.3 (C. 52:32-60.1).
 - b. The board may also report to the board's attorney the name of that person, together with its information as to the false certification, and the board's attorney may determine to bring such civil action against the person to collect such penalty.

1.13 EQUAL EMPLOYMENT OPPORTUNITIES AND AFFIRMATIVE ACTION

- A. Bidders are required to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 et seq.
 - 1. Each contractor shall submit to the public agency, after notification of award but prior to execution of a goods and services contract, one of the following three documents:
 - a. "A photocopy of a valid letter that the contractor is operating under an existing Federally approved or sanctioned affirmative action program; or
 - b. "A photocopy of a Certificate of Employee Information Report approval, issued in accordance with N.J.A.C. 17:27-4"; or
 - c. "A photocopy of an Employee Information Report (Form AA302) provided by the Division and distributed to the public agency to be completed by the contractor.
- B. Initial Project Workforce Report - Construction (AA201)
 - 1. In accordance with the requirements of the New Jersey Department of Labor & Workforce Development Construction EEO Compliance Monitoring Unit, the Initial Project Workforce Report-Construction(AA201)document, must be submitted to the Public Agency that awards the contract and the Department of Labor & Workforce Development Construction EEO Compliance Monitoring Program after notification of award, but prior to signing the contract.

https://www.nj.gov/treasury/contract_compliance/documents/pdf/guidelines/pa.pdf

1.14 OFFICE OF THE STATE COMPTROLLER

- A. N.J.A.C. 17:44-2.2: Authority to Audit or Review Contract Records
 - 1. Relevant records of private vendors or other persons entering into contracts with covered entities are subject to audit or review by the Office of the State Comptroller (OSC) pursuant to N.J.S.A. 52:15C-14(d).
 - a. (The contract partner) shall maintain all documentation related to products, transactions or services under this contract for a period of **five (5) years** from the date of final payment. Such records shall be made available to the New Jersey Office of the State Comptroller upon request.
- B. Contractor/Vendor Requirements-Office of the New Jersey State Comptroller
 - 1. Contractors/vendors doing business with the board of education are reminded of the following legal requirements pertaining to the Office of the New Jersey State Comptroller:
 - a. Access to Relevant Documents and Information - N.J.S.A. 52:15C-14 (d)
 - 1) Private vendors or other persons contracting with or receiving funds from a unit in the Executive branch of State government, including an entity exercising executive branch authority, independent State

authority, public institution of higher education, or unit of local government or board of education shall upon request by the State Comptroller provide the State Comptroller with prompt access to all relevant documents and information as a condition of the contract and receipt of public monies. The State Comptroller shall not disclose any document or information to which access is provided that is confidential or proprietary. If the State Comptroller finds that any person receiving funds from a unit in the Executive branch of State government, including an entity exercising executive branch authority, independent State authority, public institution of higher education, or unit of local government or board of education refuses to provide information upon the request of the State Comptroller, or otherwise impedes or fails to cooperate with any audit or performance review, the State Comptroller may recommend to the contracting unit that the person be subject to termination of their contract, or temporarily or permanently debarred from contracting with the contracting unit.

- b. Maintenance of Contract Records - N.J.A.C. 17:44-2.2
 - 1) Relevant records of private vendors or other persons entering into contracts with covered entities are subject to audit or review by OSC pursuant to N.J.S.A. 52:15C-14(d).
 - 2) The contractor/vendor to whom a contract has been awarded, shall maintain all documentation related to products, transactions or services under this contract for a period of five years from the date of final payment. Such records shall be made available to the New Jersey Office of the State Comptroller upon request.

1.15 ANTI-BULLYING BILL OF RIGHTS ACT (P.L. 2010.C.122)

A. N.J.S.A. 18A:37-16 provides:

1. A member of a board of education, school employee, student or volunteer shall not engage in reprisal, retaliation or false accusation against a victim, witness or one with reliable information about an act of harassment, intimidation or bullying.
2. A member of a board of education, school employee, contracted service provider, student or volunteer who has witnessed, or has reliable information that a student has been subject to, harassment, intimidation or bullying shall report the incident to the appropriate school official designated by the school district's policy, or to any school administrator or safe schools resource officer, who shall immediately initiate the school district's procedures concerning school bullying.
3. A member of a board of education or a school employee who promptly reports an incident of harassment, intimidation or bullying, to the appropriate school official designated by the school district's policy, or to any school administrator or safe schools resource officer, and who makes this report in compliance with the procedures in the district's policy, is immune from a cause of action for damages arising from any failure to remedy the reported incident.

4. A school administrator who receives a report of harassment, intimidation, or bullying from a district employee, and fails to initiate or conduct an investigation, or who should have known of an incident of harassment, intimidation, or bullying and fails to take sufficient action to minimize or eliminate the harassment, intimidation, or bullying, may be subject to disciplinary action.

1.16 CONTROLLING SILICA EXPOSURES IN CONSTRUCTION

- A. Occupational Safety and Health Administration (OSHA) - U.S. Department of Labor: OSHA 29 CFR 1926.1153, 2017.
 1. The above referenced guidance advisory document is not a standard or regulation, and it creates no new legal obligations. The document is advisory in nature, informational in content, and is intended to assist employers in providing a safe and healthful workplace. The Occupational Safety and Health Act requires employers to comply with safety and health standards promulgated by OSHA or by a state with an OSHA approved state plan. In addition, pursuant to Section 5(a)(1), the General Duty Clause of the Act, employers must provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm. Employers can be cited for violating the General Duty Clause if there is a recognized hazard and they do not take reasonable steps to prevent or abate the hazard. However, failure to implement any specific recommendations contained within this document is not, in itself, a violation of the General Duty Clause. Citations can only be based on standards, regulations, and the General Duty Clause.
 - a. This guidance document addresses the control of employee exposures to respirable dust containing crystalline silica, which is known to cause silicosis, a serious lung disease, as well as increase the risk of lung cancer and other systemic diseases.
 - b. This document provides information on the effectiveness of various engineering control approaches for several kinds of construction operations and equipment, and contains recommendations for work practices and respiratory protection, as appropriate.
 - c. OSHA encourages employers to conduct periodic exposure monitoring to confirm that engineering and work practice controls are effective and that appropriate respiratory protection is being used where necessary.
 2. The above referenced advisory document can be found at:
https://www.osha.gov/dsg/topics/silicacrystalline/construction_info_silica.html

1.17 CERTIFICATION OF NON-DEBARMENT FOR FEDERAL GOVERNMENT CONTRACTS

1. Pursuant to N.J.S.A. 52:32-44.1, any natural person, company, firm, association, corporation, or other entity prohibited, or "debarred," from contracting with the federal government agencies, shall also be prohibited from contracting for public work in the state of New Jersey. This prohibition also extends to any affiliate

organization(s) held by or subject to the control of an entity of that prohibited person or entity.

2. Prior to awarding a contract for public work, a local units must obtain written certification from the contracting person or entity through the form (Certification of Non-Debarment for Federal Government Contracts, N.J.S.A. 52:32-44.1 (P.L. 2019, c406), attesting to their non-debarment from contracting with federal government agencies.

1.18 CONTRACTOR EMPLOYEES PROCEDURE FOR CRIMINAL HISTORY RECORD CHECKS

1. The Office of Student Protection (OSP) suggests the following recommendation when educational facilities submit contractor employees (i.e., masons, building and roofing companies) for short-term and long-term projects. The school official, acting as a liaison to the construction contractor, must share with other school district administrators the names of the company's employees who will be submitting to a criminal record check. This process will assure that employees of the contractor who have not obtained their approval for employment and are disqualified or ineligible for school employment will be identified as a contractor service provider employee and not continue to be employed at school facilities and have direct contact with the student population.
2. To ensure compliance with the requirements of N.J.S.A. 18A:6-7.2, the Chief School Administrator shall direct the school official acting as a liaison to the construction company to obtain a list of individuals who will be employed by the contractor for the school facility project that will be undergoing a criminal history record check. The liaison shall then provide a copy of this list to the Superintendent's Office and Human Resource Director, as these offices will receive any adverse action correspondence from the OSP related to the criminal history record check process.
3. Upon receipt of disqualification or ineligibility correspondence, the Superintendent's Office or Human Resource personnel shall review the contracted company list in order to determine if the subject of that letter is either a school employee or an employee of any contract service provider and take the appropriate action.
4. As with any school employee, **no employee of a contract service provider** shall commence work at a school facility without having first obtained an approval for employment from the Office of Student Protection.
5. Approvals for employment for these type contracted employees shall be maintained with the liaison and copies forwarded to the Superintendent's Office.

1.19 LABOR-REGISTERED APPRENTICESHIP PROGRAM

1. As of May 1, 2019, P.L. 2019, c.21 requires contractors that directly employ craftworkers to participate in a United States Department of Labor-registered apprenticeship program as a condition of initial or renewed PWCR registration. Contracting units are not responsible for verifying contractor participation in a registered apprenticeship program.
2. A contractor working on a Public Works Project who directly employs craft workers, must certify to the NJDOL that they participate in a registered Apprenticeship Program for each craft they employ as defined in N.J.S.A. 34:11-56 and CFR , et al.
3. Registered apprenticeship program” means an apprenticeship program which is registered with and approved by the USDOL, which provides each trainee with combined classroom and on-the-job training in an occupation recognized as an apprenticeable occupation, and which meets the program standards of enrollment and graduation under 29 C.F.R. §29.6.

1.20 NEW JERSEY PREVAILING WAGE ACT - BILL A4869

1. An Act concerning certain contracts for public work and amending and supplementing P.L.1963, c.150.

Be It Enacted by the Senate and General Assembly of the State of New Jersey:

- a. C.34:11-56.27a Lowest bidder of public work contract, proof of prevailing wage rates payment; rules, regulations.

- 1) a. If a person makes the lowest bid for a contract with a public body for public work subject to the provisions of the “New Jersey Prevailing Wage Act,” P.L.1963, c.150 (C.34:11-56.25 et seq.) and that bid is ten percent or more lower than the next lowest bid for the contract, the person making the lowest bid shall certify to the public body that the prevailing wage rates required by that act shall be paid. If the bidder does not provide the certification prior to award of the contract, the public body shall award the contract to the next lowest responsible and responsive bidder. This certification shall be required only when a public body is engaging in competitive bidding for public work.

- b. The Commissioner of Labor and Workforce Development, in consultation with the Division of Local Government Services in the Department of Community Affairs, shall promulgate rules and regulations concerning the standardization of the certification necessary to effectuate the provisions of this section.

- 2) Section 3 of P.L.1963, c.150 (C.34:11-56.27) is amended to read as follows: C.34:11-56.27 Prevailing wage rate required in contract.

3) a. Every contract in excess of the prevailing wage contract threshold amount for any public work to which any public body is a party or for public work to be done on property or premises owned by a public body or leased or to be leased by a public body shall contain a provision stating the prevailing wage rate which can be paid (as shall be designated by the commissioner) to the workers employed in the performance of the contract and the contract shall contain a stipulation that such workers shall be paid not less than such prevailing wage rate. Such contract shall also contain a provision that in the event it is found that any worker, employed by the contractor or any subcontractor covered by said contract, has been paid a rate of wages less than the prevailing wage required to be paid by such contract, the public body, the lessee to whom the public body is leasing a property or premises or the lessor from whom the public body is leasing or will be leasing a property or premises may terminate the contractor's or subcontractor's right to proceed with the work, or such part of the work as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The contractor and his sureties shall be liable for any excess costs occasioned thereby to the public body, any lessee to whom the public body is leasing a property or premises or any lessor from whom the public body is leasing or will be leasing a property or premises.

b. The Commissioner of Labor and Workforce Development, in consultation with the Division of Local Government Services, shall promulgate rules and regulations concerning the standardization of the contractual language necessary to effectuate the provisions of this section.

4) This act shall take effect 180 days from the date of enactment, except that the Commissioner of Labor and Workforce Development make take any anticipatory action in advance thereof as may be necessary for the implementation of this act.

Approved November 8, 2021.

END OF SECTION 00860

EXHIBIT B
MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE
N.J.S.A. 10:5-31 et seq. (P.L.1975, c.127)
N.J.A.C. 17:27-1.1 et seq.
CONSTRUCTION CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affection or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, upgrading, demotion, or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

When hiring or scheduling workers in each construction trade, the contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. 17:27-7.2; provided, however, that the Dept. of LWD, Construction EEO Monitoring Program, may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures prescribed by the following provisions, A, B, and C, as long as the Dept. of LWD, construction EEO Monitoring Program is satisfied that the contractor or subcontractor is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Dept. of LWD, Construction EEO Monitoring Program, that its percentage of active "card carrying" members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with N.J.A.C 17:27-7.2. The contractor or subcontractor agrees that a good faith effort shall include compliance with the following procedures:

- (A) If the contractor or subcontractor has a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the contractor or subcontractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et seq., as supplemented and amended from time to time and the American with Disabilities Act. If the contractor or subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the contractor or subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

EXHIBIT B (Continued)

- (B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the contractor does not have a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor agrees to take the following actions:
- 1) To notify the public agency compliance officer, the Dept. of LWD, Construction EEO Monitoring Program, and minority and women referral organizations listed by the Division pursuant to N.J.A.C. 17:27-5.3, of its workforce needs, and request referral of minority and women workers;
 - 2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;
 - 3) Prior to commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade;
 - 4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area;
 - 5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and nondiscrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;
 - 6) To adhere to the following procedure when minority and women workers apply or are referred to the contractor or subcontractor:
 - i. The contractor or subcontractor shall interview the referred minority or women worker.
 - ii. If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the contractor or subcontractor shall in good faith determine the qualifications of such individuals. The contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the contractor or subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.
 - iii. The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Dept. of LWD, Construction EEO Monitoring Program, the contractor or subcontractor shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.
 - iv. If, for any reason, said contractor or subcontractor determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the contractor or subcontractor shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Dept. of LWD, Construction EEO Monitoring Program.
 - 7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, on forms made available by the Dept. of LWD, Construction EEO Monitoring Program upon request.
- (C) The contractor or subcontractor agrees that nothing contained in (B) above shall preclude the contractor or subcontractor from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county employment goal, the contractor or subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the contractor or subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which

EXHIBIT B (Continued)

result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ration established by practice in the area for said construction trade. Also, the contractor or subcontractor agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction contract, the contractor shall submit to the public agency compliance officer and the Dept. of LWD, Construction EEO Monitoring Program an initial project workforce report (Form AA-201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its website, for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7. The contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the Dept. of LWD, Construction EEO Monitoring Program, and to the public agency compliance officer.

The contractor agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off-the-job programs for outreach and training of minorities and women.

- (D) The contractor and its subcontractors shall furnish such reports or other documents to the Dept. of LWD, Construction EEO Monitoring Program as may be requested by the Dept. of LWD, Construction EEO Monitoring Program from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Dept. of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

(Revised: January, 2016)

Reviewed By: _____

Title: _____

Company: _____

Date: _____

Signature: _____

SECTION 00870 - MISCELLANEOUS REQUIREMENTS

PART 1 - GENERAL

1.1 JOB SITE MEETINGS

- A. Regularly scheduled job meetings shall be held at a location and time convenient to the Owner's Representatives, the Architect and the Contractor. The Prime Contractor shall attend such meetings, or be represented by a person in authority who can speak for and/or make decisions for the Contractor.
- B. Attendance by the Contractor is mandatory, whether the meetings are weekly, bi-weekly or at whatever interval is determined by the Architect.
 - 1. Unless given prior approval by the Architect, the Prime Contractor will be fined \$250.00 for each regularly scheduled meeting for which he/she is not presented by a person in authority who can speak for and/or make decisions for the Contractor. Fine amounts shall be withheld and deducted from the Contract Sum.

1.2 STRUCTURAL SAFETY STANDARDS AND CODES

- A. The standards, codes and design data referred to in the New Jersey "State Uniform Construction Code", apply to the work of the Contract, where applicable.
- B. Contractor shall comply with all applicable requirements of the Uniform Fire Safety Act, N.J.S.A. 52:27D-192 et seq.

1.3 OWNER'S RIGHT TO OCCUPY

- A. The Owner reserves the right to occupy any portion of the Project which is ready for occupancy prior to completion and acceptance of the Project, after Local Municipal Construction Enforcing Agency approval.
- B. The occupancy of any portion of the Project does not constitute an acceptance of any work nor does it waive the Owner's right to liquidated damages or constitute an acceptance of any work as the Project will be accepted as a whole and not in units. Prior to such occupancy, however, the Architect, a representative of the Owner, and the Contractor shall fully inspect the portions of the Project to be occupied, preparing a complete list of omissions of materials, faulty workmanship, or any items to be repaired, torn out or replaced. The Owner will assume responsibility for damage to premises so occupied of any items not on this list when such damage is due to greater than normal wear and tear, but does not assume responsibility for improper or defective workmanship or materials.

1.4 OWNER'S GENERAL REQUIREMENTS

- A. The Owner requires that the Contractor demonstrate a safety and health program/plan, which includes, but is not limited to first aid, fire protection, housekeeping, illumination, sanitation, personal protective equipment, medical, exit, emergency action plans and all other issues required by government agencies having jurisdiction over the work of this project.
- B. The following Owner's General Requirements shall be enforced during construction and until final completion of the work:
 - 1. No deliveries of construction materials or equipment is to take place during the arrival and departure of students from the school. Verify and coordinate arrival and departure time with the Principal.
 - 2. All construction materials and equipment shall be stored behind the construction fence.
 - 3. No smoking on any of the School's Property.
 - 4. All workers must wear shirts at all time.
 - 5. Use of profanity will not be tolerated.
 - 6. The Prime Contractor shall provide identification cards for his/her subcontractors, employees, etc.
 - 7. The Contractor shall comply with the requirements of all local ordinances including for noise.
 - 8. The Contractor and his/her subcontractors shall not interact with students or staff, other than those identified by the Owner as a representative of the Owner.
- C. The Owner will retain an Owner's Representative (Construction Manager) for this project. The Contractor shall cooperate and coordinate fully with the Owner's Representative. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Owner's Representative. The Owner's Representative and Architect will review all Applications for Payment (including Schedule of Values) by the Contractor, Requests for Information, Project Schedule and Change Orders in accordance with the Contract Documents. The Owner's Representative shall at all times have access to all work in progress and shall be copied on all project correspondence.

1.5 ENVIRONMENTAL PROTECTION

- A. Conform to New Jersey Department of Environmental Protection Regulations N.J.A.C. 7:27, sub-chapters 5 and 7 and all other applicable standards.

- B. Conform to New Jersey Statute N.J.S.A. 26:2C-9.2 which requires that no person shall construct, install, alter or operate any equipment capable of causing the emission of air contaminants into the open air or control apparatus which prevents or controls the emission of air contaminants until an application has been filed with and approved by the Department of Environmental Protection.

1.6 CERTIFIED PAYROLLS

- A. Pursuant to N.J.A.C. 12:60-5.1(c)(1)(i), the Contractor shall furnish to the Owner certified payroll records each payroll period within ten (10) days of the payment of wages, indicating name, craft, social security number and actual hourly rate of wages paid to each worker employed on the project. A certified payroll record is defined as "a payroll record which is attested to by the employer, or a corporate officer of such company, or an authorized agent of the employer."

1.7 OPERATION AND MAINTENANCE

- A. Contractor shall furnish to the Owner all required operation and maintenance manuals for all included materials and equipment as well as assistance and training to the Owner's personnel for contract's special systems and equipment in accordance with Contract Documents.
 - 1. Contractor shall submit electronic version of the MEP/FP O&M Manuals for review by the MEP/FP Consultant. Paper copies should not be submitted as part of the MEP/FP review process.

END OF SECTION 00870

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The work of this Section applies to all Construction Contract Documents including drawings, Division 1 - Miscellaneous Requirements Sections, and Specifications Sections included in Part-2 through Part-6.

1.2 SUMMARY

- A. Section Includes:
 - 1. Project description.
 - 2. Contract scope description.
 - 3. Contractor's use of the premises.
 - 4. Preconstruction meeting.
 - 5. Security procedures.

1.3 PROJECT DESCRIPTION

- A. The project consists of the STEM Lab Alterations and Renovations at the Clearview Regional Middle School for the Clearview Regional High School District, Board of Education, Gloucester County, New Jersey.
- B. Contract Documents prepared by Fraytak Veisz Hopkins Duthie, P.C. Architects / Planners, (Project Number: FVHD-5162C) and their Consulting Engineer:
 - 1. Consulting Mechanical/Electrical Engineer: Gillan & Hartmann, Inc., Mont Clare, PA.

1.4 CONTRACT SCOPE DESCRIPTION

- A. The work consists of but is not limited to the following:
 - 1. Alterations and Renovations to the existing Wood Shop to convert the space to a STEM Classroom and Lab / Robotics Area.
 - 2. Removal of an existing exterior door and concrete pad. Provide and install a pair of FRP doors and ADA accessible concrete slab.
 - 3. All plumbing, mechanical and electrical system work as indicated on the drawings.
 - 4. All indicated casework and equipment.
 - 5. All other indicated work.

- B. Single Overall Contract: This contract includes:
1. All work in accordance with drawings, Parts 2, 4, 5 and 6 Specification Sections and in accordance with Contract Documents.
 2. General Construction Work includes:
 - a. Work that is primarily architectural and civil in nature plus work traditionally recognized as general construction in accordance with drawings and as listed as a part of Part 2 specification sections, unless otherwise indicated below:
 - 1) Also includes both administrative and coordination responsibilities.
 - a) General Construction Contractor is responsible for all coordination between his/her work and work of all Prime Subcontractors.
 - 2) All initial excavation inside the building, and the preparation of the subbase under the concrete slab.
 - 3) All earthwork, site utility work outside the building, as specified in Part 2 specification sections.
 - 4) All concrete work in accordance with Part 2 specification sections.
 - 5) Provide and install the Miscellaneous Structural Steel.
 - 6) Provide and install the metal fabrications, aluminum handrails and railings in accordance with Division 2 Sections.
 - 7) Coordination of all required structural framing and supports for mechanical and electrical work whether shown or not.
 - 8) Furnishing stainless steel sinks, fixtures, accessories, and all items supplied by the casework and equipment subcontractor in accordance with drawings and specification sections in Division 11, for installation by the Plumbing Work Subcontractor.
 - 9) Furnishing all electrical devices and items supplied by the casework and equipment subcontractor in accordance with drawings and specification sections in Division 11 for installation by the Electrical Work Subcontractor.
 3. Plumbing, Drainage System Work includes:
 - a. Piping servicing domestic water piping, drainage system work and connection of equipment tied into the above types of systems and including all work in accordance with drawings and Part-4 specification sections.
 - 1) Work shall include demolition and removals, as indicated or required, to allow for new construction.
 - 2) Work shall include reinstallation, cutting, patching, finishing and repair work associated with Plumbing and Drainage system work, as indicated or required, including work at existing roofs; cutting, alterations, replacement and flashing work, where indicated or required.
 - a) Roofing work shall be performed in accordance with requirements of existing roofing system's warranty and the Contract Documents.
 - b. Subsequent excavation, backfill and compaction of trenches after the work of the General Construction Work, as required by the installation of plumbing utilities inside the building. Work shall be performed in accordance with requirements of Part-2 Specification sections.

4. Heating, Ventilating, Air Conditioning and Refrigeration Work includes:
 - a. Heating, ventilating, and air conditioning systems as well as the temperature control systems and including all work in accordance with drawings and Part-5 specification sections.
 - 1) Work shall include demolition and removals, as indicated or required, to allow for new construction.
 - 2) Work shall include reinstallation, cutting, patching, finishing and repair work associated with HVACR work, as indicated or required, including performing work at existing roofs; cutting existing roof decking, provide and install structural steel support, and all other roof flashing work where indicated or required.
 - a) Furnishing and installing all required structural framing and supports for roof top mechanical equipment at existing building, whether shown or not.
 - b) Structural framing shall be as per typical roof framing conditions as shown on architectural drawings and/or as per approved shop drawings by the Architect.
 - c) Roofing work shall be performed in accordance with requirements of existing roofing system's warranty and the Contract Documents.
5. Electrical Work includes:
 - a. The work necessary for electrical power distribution, lighting, and the connections to equipment tied into such systems, including all work in accordance with drawings and Part-6 specification sections.
 - 1) **Work shall include power distribution and wiring for all indicated electrically operated equipment and fixtures, (in Parts 2, 4, 5 and 6), whether shown or not on drawings.**
 - 2) Work shall include demolition and removals, as indicated or required, to allow for new construction.
 - 3) Work shall include reinstallation, cutting, patching, finishing and repair work associate with Electrical work, as indicated or required, including performing work at existing roof(s); cutting existing roof decking, and all other roof flashing work:
 - a) Roofing work shall be performed in accordance with requirements of existing roofing system's warranty and the Contract Documents.
 - b. Subsequent excavation, backfill and compaction of trenches after the work of the General Construction, above, as required by the installation of electrical utilities inside the building. Work shall be performed in accordance with requirements of Part-2 Specification sections.

1.5 CONTRACTOR'S USE OF THE PREMISES

- A. The space available to the Contractor for the performance of the work, either exclusively or in conjunction with others performing other construction as part of the project, is shown on the drawings.

1. Other areas are off limits to all construction personnel.

- B. The following building facilities may not be used by construction personnel:
 - 1. Toilet facilities.
 - 2. Food service facilities, including dining areas.
- C. The Owner will partially occupy the building during the construction period.
 - 1. The Owner will endeavor to cooperate with the Contractor's operations when the Contractor has notified the Owner in advance of need for changes in operations in order to accommodate construction operations.
 - 2. Conduct the work so as to cause the least interference with the Owner's operations.
- D. Coordinate with Local Authorities as to which routes are capable of handling heavy truck traffic.
- E. Signs: Provide signs adequate to direct visitors.
 - 1. Do not install, or allow to be installed, signs other than specified sign(s) and signs identifying the principal entities involved in the project.
- F. All deliveries by the Contractor shall be coordinated with the Owner's Representative/ Construction Manager, prior to the delivery date.

1.6 PRECONSTRUCTION MEETING

- A. A preconstruction meeting will be held at a time and place designated by the Architect/ Construction Manager for the purpose of identifying responsibilities of the Owner's / Architect's / Construction Manager's personnel and explanation of administrative procedures.
- B. The Contractor shall also use this meeting for the following minimum agenda:
 - 1. Construction schedule.
 - 2. Use of areas of the site.
 - 3. Delivery and storage.
 - 4. Safety.
 - 5. Security.
 - 6. Cleaning up.
 - 7. Subcontractor procedures relating to:
 - a. Submittals.
 - b. Change orders.
 - c. Applications for payment.
 - d. Record documents.

C. Attendees shall include:

1. The Owner / Owner's Representative.
2. Construction Manager.
3. The Architect, and any Consultants.
4. The Prime Contractor and his/her superintendent.
5. Major Subcontractors, suppliers, and fabricators.
6. Others interested in the work.

1.7 SECURITY PROCEDURES

- A. Limit access to the site and building to persons involved in the work.
- B. Provide secure storage for materials for which the Owner has made payment and which are stored on-site.
- C. Secure completed work as required to prevent loss.
- D. The Contractor, and their employees, will be required to be registered with the Owner's Representative / School's Main Office.
 1. The Contractor's personnel and Subcontractors will be required to wear identification badges at all times on the site.

END OF SECTION 01010

SECTION 01020 - ALLOWANCES

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. Definitions and Explanations: Certain requirements of the work related to each allowance are shown and specified in the contract documents. The allowance has been established in lieu of additional requirements for that work, and further requirements thereof (if any) will be issued by change order.
- B. The types of allowances scheduled herein for the work include the following:
1. Lump sum allowances.
- C. Selection and Purchase: At the earliest feasible date after the award of the Contract, advise the Architect of the scheduled date when the final selection and purchase of each product or system described by each Allowance must be accomplished in order to avoid delays in the performance of the work. Obtain and submit proposals for the work of each Allowance, as required by the Architect for use in making the final selections; include whatever recommendations for selection may be relevant to the proper performance of the work. Purchase products and systems as specifically selected (in writing) by the Architect.
1. Submit proposals and recommendations, for the purchase of the products or systems of Allowances, in the form specified for change orders.
- D. Change Order Data: Where applicable, include in each change order proposal both the quantity of the products being purchased and the unit cost, along with the total amount of the purchase to be made. Where requested, furnish survey-of-requirements data to substantiate the quantity. Indicate applicable taxes, delivery charges, and amounts of applicable trade discounts.
- E. Lump-Sum Allowances: The amounts herein specified are the net amounts available for purchase of the materials specified, including taxes (if any), and each change order amount shall be based thereon. **All other costs associated with the performance of the work under the Allowance, including but not limited to insurance, storage, handling, overhead, profit, etc., are not a part of the allowance, and shall be included in the lump sum bid / or base bid Contract amount.**
1. In the event the actual purchase amount of materials, plus taxes (if any) exceeds the specified allowance, the Owner will pay the excess; should the actual purchase amount, plus taxes (if any) be less than the specified Allowance, the Contractor shall credit the Owner with the difference.
 2. The actual purchase amount, plus taxes (if any) shall be substantiated by certified bills of sale to be submitted with the change order.

- F. Change Order Mark-Up: Except as otherwise indicated, comply with the provisions of the General Conditions and the Supplementary General Conditions.
- G. Excess Materials: Submit invoices or delivery slips to indicate the actual quantities of materials delivered to the site for use in fulfillment of each allowance. Where economically feasible, and so requested by the Architect, return unused materials to the manufacturer/supplier for credit to the Owner, after the installation has been completed and accepted. Where not economically feasible to return for credit, and so requested by the Architect, prepare unused materials for the Owner's storage, and delivery to the Owner's storage space as directed. Otherwise, disposal of excess materials is the Contractor's responsibility.

1.2 SCHEDULE OF ALLOWANCES

- A. General: The following allowance amounts are included in the Contract Sum, for the corresponding units of work as described.
 - 1. Construction Work
 - a. A sum of **\$40,000.00** for work not specifically shown on the drawings, the work shall be performed as directed in the field.

END OF SECTION 01020

SECTION 01040 - COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The work of this Section applies to all Construction Contract Documents including drawings, Division 1 - Miscellaneous Requirements Sections, and Specifications Sections included in Part-2 through Part-6.

1.2 REQUIREMENTS INCLUDED

- A. Coordination of submittals.
- B. Coordination meetings.
- C. Coordination drawings.
- D. Coordination of project closeout.
- E. Administrative/supervisory personnel.
- F. Coordination of trades.
- G. Coordination of space.
- H. Coordination of field measurements and field conditions.

1.3 GENERAL REQUIREMENTS

- A. The Prime Contractor shall coordinate his/her activities with the activities of their Subcontractors and work performed by others.
- B. If necessary, inform each party involved, in writing, of procedures required for coordination; include requirements for giving notice, submitting reports, and attending meetings.
 - 1. Inform the Architect when coordination of his/her work is required.

1.4 COORDINATION OF SUBMITTALS

- A. Coordinate and correlate the submittals on each work item and on interrelated work items to ensure their timeliness, completeness, consistency, compatibility and compliance with the Contract Documents.
- B. Prepare and submit special coordination drawings where close and careful coordination of information is required for proper fabrication or installation of

materials, products or equipment by separate entities. Coordination drawings may also be required where limited space availability necessitates close and careful coordination for efficient and proper installation of different components.

1. Show interrelationships of components shown on separate shop drawings.
 2. Indicate required installation sequences.
 3. (See also the requirements for the general coordination drawings under paragraph 1.7 below).
- C. Coordinate any request for substitution to ensure compatibility of its space requirements, its operating characteristics and elements and its effects on other work. Prior to proposing a substitution for any item, verify that its size, configuration, supports and connections will coordinate with all other work and that it will fit within the allotted space while allowing for proper operating, maintenance and circulation space.
- D. Comply with requirements for requests for submittal of substitution indicated in AIA A201 and Section 00800.

1.5 COORDINATION MEETINGS

- A. The General Construction Work Contractor shall hold additional coordination meetings and conferences with Prime Work Subcontractors and others involved in the Work as needed to ensure coordination of work.
1. Notify the Construction Manager and Architect of such coordination meetings.
- B. Regular project site meetings shall be in accordance with Sections 00870 and 01200.

1.6 COORDINATION OF TRADES

- A. Coordinate construction activities included under various sections of these Specifications to ensure efficient and orderly installation of each part of the Work and to prevent interferences among parts of the Work. Coordinate work items and construction operations included under different sections of the Specifications that are dependent upon one another for proper installation, connection and operation.
1. Where installation of one part of the Work is interrelated with installation of other components, schedule construction activities in the sequence required to obtain the best results.
 2. Where availability of space is limited, coordinate installation of different components to prevent interferences and to ensure proper accessibility for required maintenance, service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Where necessary, prepare memoranda outlining special procedures required for coordination. Include such items as required notices, reports and attendance at meetings. Distribute these coordination memoranda to all parties involved in the work being coordinated.
1. Prepare similar memoranda for the Owner and other Contractor(s) where coordination with construction or operations by them is required.
 2. Provide copies of such coordination memoranda to the Architect.
- C. Coordinate the scheduling and timing of required administrative activities with other construction activities to avoid conflicts and ensure orderly progress of the Work. Administrative activities include:
1. Preparation and updating of schedules.
 2. Preparation and processing of submittals.
 3. Preparation and processing of requests for information.
 4. Project meetings.
 5. Testing and inspection activities.
 6. Project close-out activities.

1.7 COORDINATION DRAWINGS

- A. General Requirements: Prepare coordination drawings where limited space available may cause conflicts in the locations of installed products, and where required to coordinate installation of products.
1. In preparing the coordination drawings, large scale details as well as cross and longitudinal sections shall be developed as required to fully delineate all conditions. Particular attention shall be given to the locations, size and clearance dimensions of equipment items, shafts and similar features.
 2. In preparing the coordination drawings, minor changes in duct, pipe or conduit routing that do not affect the intended functions may be made as required to avoid space conflicts, when mutually agreed, but items may not be resized or exposed items relocated or other features affecting the function or aesthetic effect of the building changed without the Architect's prior review and acceptance. It should be assumed that no changes shall be made in any wall or chase locations, ceiling heights, door swings or locations, or window or other

openings. If conflicts or interferences cannot be satisfactorily resolved, then the Architect shall be notified and their determinations obtained. Any conflicts or design deviations shall be specifically identified on drawings submitted to them.

3. The coordination drawings shall be submitted, in all cases, in ample time to avoid construction delay. The coordination drawings submitted may lack complete data in certain instances pending receipt of shop drawings, but sufficient space shall be allotted for the items missing, as evidenced by the sign-off of the party responsible for the missing items. When the missing information is available, it shall be promptly incorporated in the composite drawings.
 4. Cost and time impacts of relocating any duct, pipe, conduit, or other material that has been installed without proper coordination between all trades involved will be charged to the responsible party. If any improperly coordinated work or work installed that is not in conformance with the approved coordination composites necessitates additional work, the cost and time impacts of all such additional work shall likewise be the responsibility of the affective party. The Architect shall be the sole judge in determining all responsibilities.
 5. All changes in the scope of work due to revisions formally issued and approved shall be shown on the composite drawings.
 6. All work on the coordination drawings shall be performed by a competent draftsmen and shall be clear and fully legible. The Architect shall be the judge of the legibility of the composite drawings.
 7. In particular, prepare the following coordination drawings:
 - a. Drawings showing all piping, duct, cabletrays, electrical ductbanks, and similar items, but not electrical conduit less than 4 inches in diameter.
 - b. Complete architectural, mechanical and electrical reflected ceiling layouts, (including ductwork, conduits, piping, lighting, etc.).
 - c. Special coordination drawings are to be provided for the following:
 - 1) Where space is limited, show plan and cross-section dimensions of space available, including structural obstructions and ceilings as applicable.
- B. The Prime Contractor shall prepare the coordination drawings required for his/her work.
- C. Layout Drawings: As soon as practical, but in no case starting later than thirty (30) days after the HVACR Work Subcontractor has received the notice to proceed, the HVACR Work Subcontractor shall prepare layout drawings of all duct work and piping at not less than 3/8" scale.
1. These drawings shall show registers, grilles, diffusers and similar features, as well as locations of all units, valves, dampers and other items requiring access for service and maintenance.

2. The drawings shall also show roof, floor and wall openings, reflected ceiling layouts, structural beams, framing and miscellaneous structural steel supports, ceiling heights, walls, floor to floor dimensions, structural columns, doors and other major architectural and structural features as shown on the architectural and structural drawings and as per approved shop drawings.

F. Composite Drawings:

1. The HVACR Work Subcontractor shall, as scheduled by the General Contractor, produce a mylar, two (2) prints and one (1) sepia of each layout drawing as described.
2. The sepia will be retained for his/her records while the mylar and two (2) prints will be formally transmitted to the Plumbing Subcontractor, with copies of the transmittal to the Architect.
3. These drawings must be hand delivered or sent via a reliable mailing service that provides receipts and guarantees 24-48 hour delivery.
 - a. Common carrier mailing will not be acceptable.
4. The Plumbing Work Subcontractor, upon receipt of these mylars, will transfer the work from his/her shop drawings to the mylars, at the same time indicating where conflicts exist between his/her work and the work already shown on the mylars.
 - a. The Plumbing Work Subcontractor will utilize a green colored pencil for the layout of his/her work.
 - b. After completion, the Plumbing Subcontractor will forward the mylars and two (2) prints to the Electrical Subcontractor while retaining a sepia for his/her records.
 - c. The same mailing procedures will pertain.
5. The Electrical Work Subcontractor will duplicate the procedure outlined above, utilizing orange colored pencil for his/her layout.
 - a. After completion the Electrical Subcontractor will forward the drawings as specified above to the Fire Protection Work Subcontractor, (Plumbing Work Subcontractor), if applicable, who will layout his/her work with a red pencil and, after completion, forward the drawings to the General Contractor, retaining a sepia for his/her records.
6. The General Construction Work Contractor shall then have the HVACR's instrumentation (ATC) Work Subcontractor review the completed composite drawings and attest to his/her concurrence that his/her work can be installed without conflict.

7. The General Construction Work Contractor will schedule coordination meetings on the job site to review the coordination drawings.
 - a. These meetings will be attended by a representative from each of the Subcontractors involved in the coordination process.
 - b. At these meetings, these Subcontractors will indicate where conflicts exist and resolve the conflicts through mutual agreement.
 - c. Should an impasse occur, the Architect will determine the resolution.
8. When all conflicts are resolved, the Subcontractors will indicate their agreement by signing these final composite drawings.
9. The drawings shall be signed-off by each of the involved Subcontractors, indicating their awareness of and agreement with the indicated routings and layouts and their interrelationship with the adjoining or contiguous work. The General Contractor shall then sign these final composite drawings.
10. The final composite drawings shall be completed and signed-off by all parties no later than ninety (90) calendar days after the General Construction Work Contractor has received the Notice to Proceed.
 - a. After the final composite drawings have been agreed upon and signed by the Subcontractors and by the General Construction Work Contractor, the General Construction Work Contractor shall provide and distribute prints to each of the Subcontractors, and four (4) sets of prints to the Architect for reference and record purposes.
 - b. The record copies of the signed-off final composite drawings shall be retained by the General Construction Work Contractor and each Subcontractor as working reference documents.
 - c. All shop drawings, prior to their submittal to the Architect / Construction Manager, shall be compared with these composite drawings and developed accordingly.
 - 1) Any revisions to the composite drawings which may become necessary during the progress of the work shall be noted by the General Construction Work Contractor and by each affected Subcontractor and shall be neatly and accurately recorded on their record copies.
11. The General Construction Work Contractor and each Subcontractor shall be responsible for the up-to-date maintenance of his/her record copies of the composite drawings and for having one up-to-date copy available at the site.
12. The composite drawings, incorporating any subsequent changes thereto, shall be utilized by the General Construction Work Contractor or each Subcontractor in the development of his/her record drawings.
13. Following sign-off of the final composite drawings, no deviations will be permitted without prior review and acceptance by the Architect.

- a. Unauthorized deviations will be subject to removal and correction at no additional cost to the Owner.
14. In areas where no HVAC work occurs, but where other mechanical and electrical installations are required, each involved Subcontractor shall be responsible for his/her own work and shall cooperate, as directed by the General Construction Work Contractor, in preparing similar layout and composite drawings.

1.8 COORDINATION OF PROJECT CLOSEOUT

- A. Coordinate completion and clean-up work and administrative activities in preparation for Substantial Completion and occupancy of the Work or of designated portions of the Work.
- B. After Owner occupancy, coordinate access for completion or correction of the work not in conformance with the Contract Documents to minimize disruption of Owner's activities.
- C. Assemble and coordinate closeout submittals specified in Section 01700.

1.9 REQUIRED ADMINISTRATIVE / SUPERVISORY PERSONNEL

- A. General: In addition to the other administrative and supervisory personnel required for the performance of the Work, the Prime Contractor shall provide specific coordinating personnel as specified herein.
- B. Project Manager / Superintendent: A full time on site Project Manager, with a recommended minimum of eight (8) years experience, including project management experience on a similar type of projects.
 - 1. The Contractor for General Construction Work shall provide a full-time staff member or members, (Project Manager/Superintendent), experienced in coordination of mechanical and electrical work on projects of this type and scale, including administration and supervision.
 - a. Responsibilities:
 - 1) Coordinate all mechanical, plumbing, and electrical work, and coordinate that work with the other work of the project.
 - 2) Where space is limited, coordinate arrangement of mechanical, electrical, and other work to fit.
 - 3) Coordinate cutting and patching activities and sequencing.
 - 4) Coordinate use of temporary facilities.
 - b. Prepare coordination drawings where required and where indicated.
 - c. Provide information to the entity preparing the progress schedule.
 - d. Participate in progress meetings; report progress, changes required in schedules, and unresolved problems.
 - e. Review submittals for compliance with the contract documents and for

- coordination with other work.
 - f. Check field dimensions, clearances, relationships to available space, and anchors.
 - g. Check compatibility with equipment, other work, electrical characteristics, and operational control requirements.
 - h. Check motor voltages and control characteristics.
 - i. Coordinate controls, interlocks, wiring of switches, and relays.
 - j. Coordinate wiring and control diagrams.
 - k. Review the effect of changes on other work.
 - l. Obtain and distribute installation data on each item of equipment requiring mechanical or electrical connections; include:
 - 1) Electrical power characteristics.
 - 2) Control wiring requirements.
 - m. Observe and maintain record of tests and inspections.
 - n. Observe work for compliance with contract documents and notify the applicable contractor in writing of observed defects in the work.
 - o. Coordinate and observe startup and demonstration of equipment and systems.
 - p. Coordinate maintenance of record documents.
 - q. Assist the Architect / Construction Manager with final inspections.
2. Other Prime Contractor(s) / Subcontractor(s) shall provide staff for coordination between trades. Staff requirements noted above represent the minimum full-time on site staff required.
 3. Staffing is subject to Owner / Architect / Construction Manager 's approvals.
 4. Staff members may not be removed or replaced without Owner/Architect's approvals.
 5. Staff name(s), duties and resumes are to be submitted to the Architect for approval within fifteen (15) days of the Notice to Proceed.

1.10 COORDINATION OF TRADES

- A. Coordinate work with other trades to eliminate any possible interference before any piping, conduit, equipment, devices, controls, supports, ductwork and fixtures are installed.
- B. Where multiple items of mechanical and electrical equipment, devices, piping, conduits, supporting metal work, hangers, pull boxes, outlets, ductwork or controls are shown on any of the Contract Documents of the various trades in the same location, coordinate and adjust items to fit within designated location(s).
- C. Provide and install necessary offsets, bends, turns and modifications in piping, ductwork, conduit and devices required to install the work without interference with that of other trades or structure, without additional cost to the Owner.

- D. For products specified to be furnished by one Contractor and installed by another Contractor:
 - 1. Contractor specified to furnish (or remove) product shall be responsible for delivery to (or return from) the project site, and shall pay transportation costs.
 - 2. Contractor specified to install product shall be responsible for coordinating product delivery, loading or unloading, storing, protecting and installing product as required.

1.11 COORDINATION OF SPACE

- A. Coordinate use of available space and sequence of installation for work (e.g., mechanical and electrical work) which is indicated diagrammatically or schematically on the drawings. Prevent physical interference of components. Follow routing shown for pipes, ducts and conduits, taking into account the limitations of available space; make runs parallel with lines of building. Utilize space efficiently to ensure proper installations (including installation of other work) and accessibility for maintenance, service and repairs.
- B. Detailed drawings of proposed departures from spatial arrangements or locations indicated in the Contract Documents, due to field conditions or other causes, shall be submitted to the Architect for review. No such departures shall be made without prior review by the Architect.
- C. Where required for coordination, the Architect will have the authority to order, as changes in the Work, changes in locations and sizes of piping, ductwork conduit, raceways and ducts. Such changes shall be made without adjustment to the Contract Sum or Contract Time.
- D. Field verify measurements of existing items and work which precedes each sequence. Ensure proper fit and location.
- E. In finished areas, conceal pipes, ducts and wiring in the construction.
- F. Coordinate locations of fixtures and outlets with finish elements.

1.12 COORDINATION OF FIELD MEASUREMENTS AND FIELD CONDITIONS

- A. Prior to ordering materials or equipment or performing work, the Contractor and/or Subcontractors shall verify Contract Document and submittal of dimensions and weights affecting their work and other Prime Contractor's work associated with field measurements and field conditions at the project site, and shall be responsible for their accuracy and correctness.

- B. Differences discovered from dimensions or weights indicated in the Contract Documents or submittals shall be submitted in writing to the Architect for review, before proceeding with the work.
- C. Commencing work implies acceptance of surfaces, areas, preceding work and other field conditions, and verification of dimensions, by the Contractor.
- D. No Change Order will be issued in cases where discrepancies in dimensions are discovered after work has been commenced or where the Contractor has failed to properly investigate and take into account field measurements and existing field conditions.
- E. Inspection of Conditions: Require the Installer of each major component to inspect both substrate and conditions under which his/her work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- F. Recheck measurements and dimensions, before starting each installation.
 - 1. Submit to the Architect for review any change in dimensions shown on the Contract Documents or submittals affecting physical size, shape or location of any part of the work, whether due to field conditions or other causes.
- G. Passage of equipment:
 - 1. Establish passage clearances required to deliver, install and erect mechanical and electrical equipment. Wherever necessary, provide equipment in sections or knocked down in order to allow passage of equipment through available openings.
 - 2. Where there is not sufficient clearance for passage of mechanical or electric equipment, deliver, install and protect such equipment before confining walls, floors, slabs and steel work are erected. Schedule and coordinate this work with the work of other trades.
 - 3. If any structure, equipment or system must be altered to allow passage of equipment, the person or entity responsible for providing that structure, equipment, or system shall restore it to its original condition, without additional cost to the Owner.
 - 4. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- H. Verify the size of shafts and chases, the adequacy of partition thickness and the clearance in double partitions and hung ceilings for proper installation of work.

1. (Sub)Contractors shall cooperate in arranging their work with other (Sub)Contractors whose work is in the same spaces.
 2. The amount of space occupied by each trade's work shall be kept to the minimum required.
 3. Arrange for chases, slots and openings in other building components during progress of construction, to allow for timely installation of work.
- I. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
 - J. Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion and building movement.
 - K. Provide all appropriate structural supports, hangers, wires for roof, floor and wall and associated assemblies which include but are not limited to materials, finishes, equipment, fixtures, piping, raceways, mechanical and electrical components. This work shall be in conformance with requirements of the Contract Documents whether or not indicated by a reference in specification or as may be in detail shown on drawings and schedules.
 - L. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.
 - M. Install each component during weather conditions and construction status that will ensure best possible results. Isolate each part of completed construction from incompatible material as necessary to prevent deterioration.
 - N. Coordinate temporary enclosures with required inspections and tests, to minimize necessity of uncovering completed construction for that purpose.
 - O. Where mounting heights are not indicated:
 1. Install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.
 2. Install mechanical and electrical systems, materials and equipment to provide maximum possible headroom. Maintain maximum headroom and space conditions. Where headroom or space conditions (less than 8'-0") appear inadequate, the Architect shall be notified before proceeding with the work.

END OF SECTION 01040

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SECTION 01050 - ALTERATIONS, CUTTING, PATCHING AND REFINISHING WORK

PART 1 - PRODUCTS

1.1 RELATED DOCUMENTS

- A. The work of this Section applies to all Construction Contract Documents including drawings, Division 1 - Miscellaneous Requirements Sections, and Specifications Sections included in Part-2 through Part-6.

1.2 DESCRIPTION

- A. Work included: Alterations, removals and demolition required for this work include, but are not necessarily limited to:
 - 1. Alterations, cutting, patching, removal and preparation work to be done as noted on drawings, as required, to complete construction.
 - 2. Patching and refinishing of existing surfaces damaged or left unfinished as a result of this work, including site work, existing ground surfaces, concrete surfaces, bituminous paving surfaces, etc.
 - 3. Asbestos.
 - a. The Contractor shall review and familiarize themselves with the Owners Asbestos Hazard Emergency Response Act (AHERA) report prior to the commencement of any demolition activity. Also, the Contractor will be provided with an inventory of all ACM (Asbestos Containing Materials) in the buildings where they are working, and will be required to sign a form (provided by the Owner) that they are in receipt of the inventory.
 - b. Contractor is herein cautioned that asbestos may be within concealed spaces where work will be taking place. The Contractor shall immediately notify the Owner if any concerns or conditions arise in regards to potential asbestos containing building materials (ACBM's) in order that the owner may verify same and take appropriate action. The Contractor shall not proceed with the work until the material has been abated and air sampling clearance levels have been achieved as set forth by the Owner's Environmental Consultant.
 - c. The Contractor shall employ personnel who are trained in accordance with OSHA workplace standards as they pertain to asbestos.
 - d. **The Architect / Engineer has no authority or professional involvement relative to the hazardous material/asbestos removal or disposal phase for this project and are not available for questions and/or direction in this regard. The hazardous material/ asbestos reference is included as a convenience for the Owner, and the Architect accepts no responsibility nor liability for the accuracy of information, bidders conclusions, methods to be used, nor for any aspect of approvals required by the Contractor in undertaking and completing this project insofar as**

hazardous material/asbestos is concerned. The Contractor shall direct any/all questions and concerns to the Owners Hazardous Material Abatement Consultant.

- e. Worker and Community Right to Know Act Requirements
 - 1) It is required that the Contractor and/or Subcontractors comply with all of the requirements of HAZCOM 2012 and New Jersey Right To Know (RTK) program. General Contractor is responsible for ensuring that containers of substances belonging to the Contractor and/or Subcontractors that are stored at the Owner's facility are properly RTK labeled. Refer to N.J.A.C. 8:59-5.10.
 - 2) Surveys of hazardous substances stored at the Owner's facility by the Contractor and/or Subcontractor are to be provided to the Owner of the facility. Refer to N.J.A.C. 8:59-2.2(h).
 - 3) Material Safety Data Sheets (MSDS) and/or Safety Data Sheets (SDS) from manufacturers must be provided to the Owner for all products present at, purchased for, and brought on site by Contractors and/or Subcontractors to the Owner's facility. Refer to N.J.A.C. 8:59-2.2(1).
 - 4) Contractor and/or all Subcontractors must submit, prior to starting any work, a copy of their approved Hazard Communication Plan - 29 CFR 1910.1200.

- 4. This project shall be subject to the requirements of the EPA "Renovation, Repair and Painting" rule including the following:
 - a. The Contractor must be lead safe trained and certified. The Contractor will be required to submit a copy of their EPA certificate prior to the start of the work.
 - b. The Contractor shall provide the Owner with a copy of the EPA's Lead Hazard Management information pamphlet "Renovate Right-Important Lead hazard Information for Families, Child Care Providers and Schools" prior to the start of any renovation work. The Contractor shall have the Owner sign a pre-renovation disclosure form confirming receipt of the pamphlet.
 - c. The Contractor shall at all times employ lead safe practices as identified in the rules.

- 5. This project shall be subject to the requirements of the EPA rules on diesel exhaust and off-site particulate dust, including the following:
 - a. Diesel exhaust contributes the highest cancer risk of all air toxics in New Jersey and is a major source of NOx within the state. Therefore, per NJ DEP recommendations, construction projects involving non-road diesel construction equipment operating in a small geographic area over an extended period of time shall implement the following measures to minimize the impact of diesel exhaust:
 - 1) All on-road vehicles and non-road construction equipment operating at, or visiting, the construction site shall comply with the three minute idling limit, pursuant to N.J.A.C. 7:27-14 and N.J.A.C. 7:27-15. Contractor shall purchase "No Idling" signs to post at the site to

remind subcontractors to comply with the idling limits. Signs are available for purchase from the Bureau of Mobile Sources at 609/292-7953 or <http://www.stopthesoot.org/sts-no-idle-sign.htm>.

- 2) All non-road diesel construction equipment greater than 100 horsepower used on the project for more than ten days shall have engines that meet the USEPA Tier 4 non-road emission standards, or the best available emission control technology that is technologically feasible for that application and is verified by the USEPA or the CARB as a diesel emission control strategy for reducing particulate matter and/or NOx emissions.
 - 3) All on-road diesel vehicles used to haul materials or traveling to and from the construction site shall use designated truck routes that are designed to minimize impacts on residential areas and sensitive receptors such as hospitals, schools, daycare facilities, senior citizen housing, and convalescent facilities.
- b. Contractor will be liable for the effects of off-site particulate dust and/or odors during construction and shall take steps to minimize the impact of air pollution from these activities.
6. **Hot Work Permit:**
- a. A Hot Work Permit is required for any operation involving “open flame” or “producing heat and/or sparks”.
 - 1) This work includes, but is not limited to, welding, brazing, cutting, grinding, soldering, thawing pipe, torch-applied roofing, or chemical welding.
 - b. Before initiating hot work, ensure precautions are in place as required by NFPA 51B and ANSI Z49.1.
 - c. Make sure an appropriate fire extinguisher is readily available.

B. Related Sections:

1. Section 00870 - Miscellaneous Requirements.
2. Section 01010 - Summary of the Work.
3. Section 01020 - Allowances.
4. Section 01040 - Coordination.
5. Section 02070 - Selective Demolition.
6. **Division 2 through 26 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.**
 - a. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 22, 23 and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
1. Location and Extent of Work: Submit key plan indicating room location where work to take place. Describe cutting and patching, indicate methods and show how they will be performed.
 2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 3. Products: List products to be used and firms or entities that will perform the Work. Provide samples and field mock-up as indicated or requested by the Architect.
 - a. Samples and field mock-up shall match existing surfaces and colors.
 - b. Obtain Architect's approval prior to proceeding with work.
 4. Schedule and Dates: Provide work schedule, indicate when cutting and patching will be performed.
 5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Coordinate cutting of operating elements with other plumbing, HVAC, electrical or other trades.
- C. Miscellaneous Building Elements: Do not cut and patch any building elements or related components in a manner that could change their operation, load-carrying

capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
 - 1. Engage experienced installers or fabricators for all work.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- F. Mock-Ups: Provide mock-ups for Architect / Construction Manager approval for each proposed patching method. Do not proceed with patching work until obtaining of approvals from the Architect / Construction Manager .

1.5 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties. Confirm existing warranties with Owner prior to starting of work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

B. Inspection:

1. Prior to start of any work the General Construction Work Contractor shall verify all existing work area conditions; building lines, lengths, corners and all other dimensions.
 - a. General Construction Work Contractor shall engage a Licensed Professional Land Surveyor (PLS) to perform layout of the site elements. Copies of all surveys performed by the General Contractor shall be submitted to the Architect in two copies and shall include layout drawings and data sheets.
 - b. All survey work must be done immediately in order to facilitate preparation of steel shop drawings by HVACR Work Subcontractor pertaining to the required supports for rooftop mechanical equipment.
2. The General Construction Work Contractor shall submit information and survey to Prime Work Subcontractor(s), the Architect / Construction Manager for all required coordination of new construction and all other related site work.
3. Prior to work of this section, verify information and survey submitted by the General Construction Work Contractor, carefully inspect the existing conditions and verify that materials and surfaces to be altered or removed are the same as noted on the drawings.

C. Discrepancies:

1. In the event of discrepancy of existing conditions, surfaces, etc., immediately notify the Architect / Construction Manager .
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. The Contractor shall provide cutting, patching, relocations, and or re-installations of existing construction to provide for installation of other components or performance of other construction associated with his/her work, and subsequently patch and finish as required to restore surfaces to their original condition. Work shall be performed whether or not shown on drawings.
 - 2. The General Construction Work Contractor shall provide all required and necessary pockets in concrete and masonry wall assemblies including all required cutting, and preparation work to allow for installation of new work. The General Construction Work Contractor shall subsequently patch as required to restore and prepare surfaces to receive new finishes.
 - a. Cutting roof decking, roof flashing, patching and associated roofing work in existing building, where no roofing replacement is indicated or required, shall be performed by the Prime Subcontractor for work included under the work of his/her scope of work.
 - 3. All repairing, patching, piecing out, filling in, restoring and refinishing shall be neatly done by craftsmen skilled in their respective trades and completed in proper manner to leave same in condition satisfactory to the Architect.
 - 4. All new work shall be installed plumb, level, true, and shall be shimmed as required to cover any irregularities in substrates.
- B. Cutting:
 - 1. Before cutting is started in any location the Contractor shall carefully investigate conditions as to human and structural safety, existing piping, wiring and items concealed, and wherever same interfere with the work they shall be properly relocated, rerouted or removed as the case may be, at no increase to contract price.
 - 2. Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed

procedures with original Installer; comply with original Installer's written recommendations.

3. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 4. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 5. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 6. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 7. Do not disturb any structural work, plumbing, steam, gas, or electric work without approval of Architect.
 8. Mechanical and Electrical Services:
 - a. Cut off pipe or conduit in walls or partitions to be removed shall be performed by respective trade.
 - b. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting shall be performed by respective trade.
 9. Proceed with patching after construction operations requiring cutting are complete.
 - a. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work.
 10. Existing work disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled or replaced with new work, and refinished and left in as good condition as existing before commencing work.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Field Mock-up: Prepare field mock-up of proposed restoration method as requested or required by the Architect. Obtain Architect's approval prior proceeding with actual work.

3. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate or minimize evidence of patching and refinishing.
4. Floors and Walls: Where walls, partitions and/or built-in cabinets that are removed extend one finished area into another, patch and repair floor and wall surfaces in the existing and new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
5. Ceilings: Cut, remove, patch, repair, install new including hanging assemblies and finish ceilings as necessary to provide an even-plane surface of uniform appearance.
6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

3.4 CLEAN-UP

- A. Areas where demolition is in progress within or adjacent to Owner occupied areas shall be broom cleaned at the end of each working day.
- B. Do not burn materials or debris on premises.
- C. Do not allow demolished materials to accumulate inside or outside of existing building.
- D. Remove from the site all rubbish and debris resulting from work of this section.
- E. If the Contractor fails to clean-up their debris within 24 hours, the Owner has the right to clean-up the debris left by the Contractor. All associated clean-up costs, incurred by the Owner, will be back-charged to the Contractor.

3.5 PROTECTION

- A. Contractor shall provide all other necessary temporary enclosures, guardrails, barricades, etc. to adequately protect all workers and public from possible injury. Provide all necessary temporary partitions, enclosures, coverings of approved materials and construction for the exclusion of weather and for confining dust and debris.

- B. Contractor shall be responsible for the protection of the existing building, facilities and improvements within the areas where work is being done. Any disturbance or damage to the work, the existing building, and improvements, equipment or any impairments of facilities resulting from his/her work, shall be promptly restored, repaired, or replaced by the responsible Contractor at no extra cost to the Owner.
- C. Adequate protection of persons and property shall be provided at all times, including Saturdays, Sundays and holidays, and during time work is being performed and after working hours. Protection shall include barricade fencing, traffic control, dust partitions, weather protection and other means as required.
- D. Preserve and protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site and along access to the site. Be responsible for all unauthorized cutting or damaging of trees and shrubs, including damage due to careless operation of equipment, stock-piling of materials or tracking of grass areas by equipment.

3.6 SALVAGE

- A. Partial Removal: Items of salvable value to Contractor may be removed from structure as work progresses. Salvage items must be transported from site as they are removed.
 - 1. Storage or sale of removed items on site will not be permitted.
- B. Items designated on drawings or in specifications to remain the property of the Owner, or to be reused, shall be removed, and securely stored with care to prevent damage. Repair or replace such items damaged in removal.
- C. Before transporting non-designated, removed items from the site, contact Architect/ Construction Manager for decision as to what items if any are to remain the property of the Owner. Items retained by the Owner will be transported by him/her to his/her storage area.

3.7 STANDARDS

- A. All demolition work shall be performed in accordance with the applicable rules and regulations and the Codes and Ordinances of local, State and Federal authorities, and in accordance with the requirements of public utility corporations.
- B. Work shall satisfy requirements of the Occupational Safety and Health Act of 1970 with amendments.
- C. Work not affected by more stringent requirements of regulatory agencies shall satisfy the provisions of ANSI-A10.6-2006 (R2016) - American National Standard Safety Requirements for Demolition.

- D. Confine the movement and storage of vehicles, equipment and materials to such routes and locations as may be designated by the Owner and Architect.
- E. The building and grounds will be maintained in a clean and orderly manner so as 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.

3.8 INGRESS, EGRESS AND CIRCULATION

- A. The Prime Contractor shall be responsible for performing his/her construction activities in such manner to maintain 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. Passageways for emergency exits shall be kept continuously free from debris, construction equipment, tools, stockpiles or materials, and other hazards to speedy evacuation. The Contractor shall provide all necessary temporary work as prudence and good practice may dictate and in accordance with Applicable Law and Authorities having jurisdiction to obtain and maintain all such ingress, egress and circulation requirements. The Prime Contractor shall be responsible for providing coordination of this temporary work between Subcontractor(s), as directed by the Architect. All temporary work shall be removed when no longer required.

3.9 NON-INTERFERENCE WITH OWNER'S OPERATIONS

- A. Work under this Contract will be performed when the existing buildings are occupied. Coordinate with Owner's schedule and operation, obtain Owner's / Construction Manager's approval prior to proceeding with work.
- B. Contractor shall acquaint himself/herself with the general character of the Owner's operations prior to commencing work and shall schedule his/her work to avoid interference therewith. The sequence of alteration operations shall be in accordance with a schedule of contract operations approved by the Owner and Architect.
- C. The Contractor shall not start work until the schedule has been approved in writing by the Architect and the Owner. The Contractor shall not perform work in occupied areas without giving the Owner 72 hours written notice of his/her intention to work in occupied areas.
- D. The Contractor shall expedite placing orders and submission of shop drawings for equipment required to complete work under this Contract to ensure delivery of all equipment with adequate time allowed to complete the installations to conform to the project completion date.

END OF SECTION 01050

SECTION 01151 - UNIT PRICES

PART 1 GENERAL

1.1 PROCEDURE

- A. Bidder shall insert on the Proposal Form, all Unit Prices applicable to the work under his/her bid. Unit Prices will be used as the basis for computing "additions to" or "deductions from" the Contract Price for extra work and for work countermanded, reduced or omitted.
- B. Except as otherwise provided in the General Conditions, the Unit Prices when accepted, adjusted or established by the Contract shall remain binding and irrevocable for the entire period of the Contract, regardless of the quantities of work ordered or required under such Unit Prices.
- C. The acceptance of the Unit Price is on condition that the general character of the material and workmanship required for any work related thereto shall be equivalent to corresponding work as shown and specified, and that all costs, overhead and profit, as well as all incidental work required in connection therewith, has been included in the Unit Price.

1.2 RULES OF MEASUREMENT: EARTHWORK

- A. Except as provision is made hereinafter for arbitrary measurement, the quantity of excavation shall be its in-place volume before removal.
- B. The reference point for computing changes in depth shall be the plan grade at which the change starts.
- C. No allowance will be made for excavating additional material of any nature taken out for the convenience of the Contractor beyond the quantity computed under these Rules of Measurement.
- D. Excavations shall be in accordance with OSHA requirements and that excavations should be shored and braced, as needed, to avoid encroaching into existing site improvements that are noted to remain undisturbed.
- E. Excavation for a footing (the pad) under a wall shall be measured as the neat plan width and depth of the footing
- F. Rock excavation shall arbitrarily be assumed to extend to vertical planes one foot beyond wall lines, pipe, etc., and to 6 inches below the established elevations.
- G. The volume of backfill shall be the volume of excavation computed under these Rules of Measurement, less the volume of actual displacement by walls, beams, columns, piers, footings or other construction installed.

H. Concrete quantities shall be computed from plan size, or if there are no drawings, from actual measurement of the work ordered and placed.

1.3 UNIT PRICES - GENERAL CONSTRUCTION: EARTHWORK

Bulk Rock and Trench or Pit Rock Excavation requiring jackhammering - Per Cubic Yard. Price shall include the breaking up of the rock by other means as directed by the Architect and its removal from the site, specified for other excavated material, and shall be the price over and above the price for earth excavation.

Unit Price for bulk rock shall be \$ 300.00 per cu. yd.

Unit Price for trench or pit rock excavation shall be \$ 400.00 per cu. yd.

If the Contractor cannot perform the work at the given unit price, he/she shall accept for consideration subcontractor's price suggested by the Owner and/or the Architect.

1.4 UNIT PRICES - GENERAL CONSTRUCTION: Materials in Place.

Excavation (unsuitable soil) \$ _____ per cu. yd.

Compacted fill \$ _____ per cu. yd.

Concrete Walk (including subbase) \$ _____ per sq. ft.

Self-Drying Finishing Underlayment per Section 03450 \$ _____ per sq. ft.

Replacement of existing damaged or deteriorated metal decking \$ _____ per sq. ft.

Replacement of existing wet or deteriorated roof insulation board \$ _____ per sq. ft.

Replacement of existing damaged or deteriorated wood nailers/blocking or framing, including removal of existing deteriorated wood, furnishing and installing new galvanized anchor bolts, expansion bolts at 4'-0" o.c. or nails through existing construction to remain: \$ 2.90 per board ft.

- a. 2x4 for the above work \$ _____ per lin. ft.
- b. 2x6 for the above work \$ _____ per lin. ft.
- c. 2x8 for the above work \$ _____ per lin. ft.
- d. 2x10 for the above work \$ _____ per lin. ft.
- e. 2x12 for the above work \$ _____ per lin. ft.

1.5 UNIT PRICES - PLUMBING & DRAINAGE: Materials in Place.

1-1/4" sanitary and vent pipe above grade \$ _____ per lin. ft.

1-1/2" sanitary and vent pipe above grade \$ _____ per lin. ft.

2" sanitary and vent pipe above grade	\$ _____ per lin. ft.
1/2" domestic hot or recirc water pipe above ground with insulation	\$ _____ per lin. ft.
3/4" domestic hot or recirc water pipe above ground with insulation	\$ _____ per lin. ft.
1" domestic hot or recirc water pipe above ground with insulation	\$ _____ per lin. ft.
1-1/4" domestic hot or recirc water pipe above ground with insulation	\$ _____ per lin. ft.
1-1/2" domestic hot or recirc water pipe above ground with insulation	\$ _____ per lin. ft.
2" domestic hot or recirc water pipe above ground with insulation	\$ _____ per lin. ft.
1/2" domestic cold water pipe above ground with insulation	\$ _____ per lin. ft.
3/4" domestic cold water pipe above ground with insulation	\$ _____ per lin. ft.
1" domestic cold water pipe above ground with insulation	\$ _____ per lin. ft.
1-1/4" domestic cold water pipe above ground with insulation	\$ _____ per lin. ft.
1-1/2" domestic cold water pipe above ground with insulation	\$ _____ per lin. ft.
2" domestic cold water pipe above ground with insulation	\$ _____ per lin. ft.
1/2" domestic cold water pipe insulation	\$ _____ per lin. ft.
3/4" domestic cold water pipe insulation	\$ _____ per lin. ft.
1" domestic cold water pipe insulation	\$ _____ per lin. ft.
1-1/4" domestic cold water pipe insulation	\$ _____ per lin. ft.
1-1/2" domestic cold water pipe insulation	\$ _____ per lin. ft.
2" domestic cold water pipe insulation	\$ _____ per lin. ft.
1/2" domestic hot or recirc water pipe insulation	\$ _____ per lin. ft.
3/4" domestic hot or recirc water pipe insulation	\$ _____ per lin. ft.
1" domestic hot or recirc water pipe insulation	\$ _____ per lin. ft.
1-1/4" domestic hot or recirc water pipe insulation	\$ _____ per lin. ft.

1/2" Type "L" copper tubing	\$ _____ per lin. ft.
3/4" Type "L" copper tubing	\$ _____ per lin. ft.
1" Type "L" copper tubing	\$ _____ per lin. ft.
1-1/2" Type "L" copper tubing	\$ _____ per lin. ft.
2" Type "L" copper tubing	\$ _____ per lin. ft.
Ball Valve, under 1"	\$ _____ per unit
Ball Valve, 1"	\$ _____ per unit
Ball Valve, 1-1/2"	\$ _____ per unit
Ball Valve, 2"	\$ _____ per unit
Balancing Valve, 1/2"	\$ _____ per unit
Balancing Valve, 3/4"	\$ _____ per unit
1-1/2" cast iron pipe above grade	\$ _____ per lin. ft.
2" cast iron pipe above grade	\$ _____ per lin. ft.
2-1/2" cast iron pipe above grade	\$ _____ per lin. ft.
3" cast iron pipe above grade	\$ _____ per lin. ft.
1-1/2" copper DWV tube	\$ _____ per lin. ft.
2" service weight cast iron pipe above floor	\$ _____ per lin. ft.
3" service weight cast iron pipe above floor	\$ _____ per lin. ft.
4" service weight cast iron pipe above floor	\$ _____ per lin. ft.

1.6 UNIT PRICES - HEATING AND VENTILATING: Materials in Place.

Galvanized steel ductwork, no liner	\$ _____ per lb.
Galvanized steel ductwork, including liner	\$ _____ per lb.
Rigid duct insulation	\$ _____ per sq. ft.
3/4" heating hot water piping	\$ _____ per lin. ft.
1" heating hot water piping	\$ _____ per lin. ft.

1-1/4" heating hot water piping	\$ _____ per lin. ft.
1-1/2" heating hot water piping	\$ _____ per lin. ft.
2" heating hot water piping	\$ _____ per lin. ft.
3/4" heating hot water piping with insulation	\$ _____ per lin. ft.
1" heating hot water piping with insulation	\$ _____ per lin. ft.
1-1/4" heating hot water piping with insulation	\$ _____ per lin. ft.
1-1/2" heating hot water piping with insulation	\$ _____ per lin. ft.
2" heating hot water piping with insulation	\$ _____ per lin. ft.
3/4" chilled water piping with insulation	\$ _____ per lin. ft.
1" chilled water piping with insulation	\$ _____ per lin. ft.
1-1/4" chilled water piping with insulation	\$ _____ per lin. ft.
1-1/2" chilled water piping with insulation	\$ _____ per lin. ft.
2" chilled water piping with insulation	\$ _____ per lin. ft.
3/4" chilled water piping	\$ _____ per lin. ft.
1" chilled water piping	\$ _____ per lin. ft.
1-1/4" chilled water piping	\$ _____ per lin. ft.
1-1/2" chilled water piping	\$ _____ per lin. ft.
2" chilled water piping	\$ _____ per lin. ft.
Ball Valve (Hydronic), under 1"	\$ _____ per unit
Ball Valve (Hydronic), 1"	\$ _____ per unit
Ball Valve (Hydronic), 1-1/4"	\$ _____ per unit
Ball Valve (Hydronic), 1-1/2"	\$ _____ per unit
Ball Valve (Hydronic), 2"	\$ _____ per unit
Balancing Valve, 3/4"	\$ _____ per unit
Balancing Valve, 1"	\$ _____ per unit
Balancing Valve, 1-1/4"	\$ _____ per unit

Balancing Valve, 1-1/2"	\$ _____ per unit
3/4" three way control valve with actuator	\$ _____ per unit
1" three way control valve with actuator	\$ _____ per unit
1-1/2" three way control valve with actuator	\$ _____ per unit
2" three way control valve with actuator	\$ _____ per unit

1.7 UNIT PRICES - ELECTRICAL WORK: Materials in Place.

Power outlet (duplex or quadraplex), including outlet boxes and wiring. Receptacles will generally be connected within 10' of adjacent receptacle circuits	\$ _____ per unit
Single Channel Surface Raceway	\$ _____ per lin. ft.
Exterior weatherproof duplex power receptacle including up to 100 feet of (2)#12, (1)#12G, in 3/4" conduit	\$ _____ per unit
Ceiling mounted occupancy sensor, including wiring	\$ _____ per unit
Photosensor (daylight harvesting sensor), including wiring.	\$ _____ per unit
Fire Alarm System - Fire Alarm Pull Device, including outlet box and wiring	\$ _____ per unit
Fire Alarm System - Smoke Detector Device, including outlet box and wiring	\$ _____ per unit
Fire Alarm system wiring	\$ _____ per lin. ft.
Fire Alarm system programming	\$ _____ per Fire Alarm point
Interior cat-6 cable	\$ _____ per lin. ft.
Dual jack data outlet and 150 ft. of cable from IDF/data cabinet	\$ _____ per unit
Twenty (20) lin. ft. of Category 6 Twisted Pair Cable	\$ _____ per unit

END OF SECTION 01151

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
 - 1. Pre-Construction Conference
 - 2. Pre-Installation Conferences
 - 3. Coordination Meetings
 - 4. Progress Meetings
- B. Construction Schedule requirements is specified in another Division 1, Section.

1.3 PRE-CONSTRUCTION CONFERENCE

- A. The Architect will schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than fifteen (15) calendar days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: The Owner, Construction Manager, Architect, and their consultants, the Prime Contractor and his/her superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.
- C. Agenda: Discuss items of significance that could effect progress including such topics as:
 - 1. Tentative construction schedule
 - 2. Critical work sequencing
 - 3. Designation of responsible personnel
 - 4. Procedures for processing field decisions and Change Orders
 - 5. Procedures for processing Applications for Payment
 - 6. Distribution of Contract Documents
 - 7. Submittal of Shop Drawings, Product Data, and Samples
 - 8. Preparation of record documents
 - 9. Use of the premises
 - 10. Office, Work, and storage areas

11. Equipment deliveries and priorities
12. Safety Procedures
13. First Aid
14. Security
15. Housekeeping
16. Working hours

1.4 PRE-INSTALLATION CONFERENCES

- A. The Prime Contractor to conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The installer and representative of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Architect / Construction Manager of scheduled meeting dates.
 1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:
 - a. Contract Documents
 - b. Options
 - c. Related change orders
 - d. Purchases
 - e. Deliveries
 - f. Shop Drawings, product data and quality control samples
 - g. Possible conflicts
 - h. Compatibility problems
 - i. Time schedules
 - j. Weather limitations
 - k. Manufacturer's recommendations
 - l. Compatibility of materials
 - m. Acceptability of substrates
 - n. Temporary facilities
 - o. Space and access limitations
 - p. Governing regulations
 - q. Safety
 - r. Inspection and testing requirements
 - s. Required performance results
 - t. Recording requirements
 - u. Protection
 2. Record significant discussions and agreements and disagreements of each conference along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner, Construction Manager and the Architect.

3. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene the conference at the earliest feasible date.

1.5 COORDINATION MEETINGS

- A. The Contractor for General Construction will conduct project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.
- B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.
- C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 PROGRESS MEETINGS

- A. Regular Progress Meetings: The Construction Manager will schedule and conduct regular progress meetings as follows:
 1. Weekly meetings with the Contractor and Subcontractors.
 2. Bi-weekly meeting with the Owner, Architect, Contractor and Subcontractors.
 - a. Weekly meetings between the Contractor and Subcontractors will be the responsibility of the Contractor and the Architect will not attend.
- B. Special Meetings will be conducted as required by the progress of the work
- C. Location of the meetings: Meetings shall be conducted at a location in the board office to be determined by the Owner's Representative.
- D. Attendance: Attendance at Construction Meetings shall be as follows:
 1. The Owner shall be in attendance at bi-weekly meetings and at any special meetings as appropriate to the agenda.
 2. The Construction Manager, Architect and their professional consultants, as needed, at bi-weekly meetings and at any special meetings as appropriate to the agenda.
 3. The Contractor at all construction meetings.
 4. Subcontractors as appropriate to the agenda.
 5. Suppliers as appropriate to the agenda.
 6. The Owner's Representative at all construction meetings.

- E. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the project.
- F. Contractor's Construction Schedule:
 - 1. Review the present and future needs of each entity present, including such items as:
 - a. Interface requirements
 - b. Time
 - c. Sequences
 - d. Deliveries
 - e. Off-site fabrication problems
 - f. Access
 - g. Site utilization
 - h. Temporary facilities and services
 - i. Hours of work
 - j. Hazards and risks
 - k. Housekeeping
 - l. Quality and work standards
 - m. Change orders
 - n. Documentation of information for payment requests
- G. Reporting: No later than three (3) business days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
- H. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.
- I. Attendance by the Contractor(s) is mandatory, whether the meetings are weekly, bi-weekly or at whatever interval is determined by the Architect and the Construction Manager.
 - 1. Unless given prior approval by the Construction Manager / Architect in writing not to attend meetings, Contractor will be fined **\$250.00** for each regularly scheduled meeting for which he/she is not represented by a person in authority who can speak for and/or make decisions for the Contractor.
 - 2. Fine amounts shall be withheld and deducted from the Contract Sum.

END OF SECTION 01200

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SECTION 01400 - MATERIAL TESTING / QUALITY CONTROL SERVICES

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 material testing and quality control services.
 - 1. **Testing and inspecting services other than the Special Inspections - Material Testing are required to verify compliance with requirements specified or indicated and are the responsibility of the Contractor. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.**
- B. Specific quality-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.
 - 1. Quality Control Services is the responsibility of the Contractor.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-control services required by Architect, and the Owner or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Division 1 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections in AIA Document A201 and Section 01200.
 - 2. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 3. Division 2 through 26 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality Control Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect
- C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples.
 - 1. Mockups establish the standard by which the Work will be judged.
- D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 REGULATORY REQUIREMENTS

- A. Copies of Regulations: Obtain copies of referenced regulations which also available in Local Public Libraries.

1.6 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Delegated-Design Submittal: When requirement is indicated in specific technical section and/or when requested by the Architect, in addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed

by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Schedule of Tests and Inspections: 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.

D. 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. Ambient 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.

E. 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.

1.7 QUALITY ASSURANCE

A. 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.

- B. **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.
- C. **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.
- D. **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.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in the jurisdiction where the 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 product 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 similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.
- G. **Testing Agency Qualifications:** An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.
 - 1. **Preconstruction Testing:** Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
 - 2. **Contractor responsibilities include the following:**
 - a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.

- d. When testing is complete, remove assemblies; do not reuse materials on Project.
 3. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and the Owner 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.
- H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect .
 2. Notify Architect seven (7) days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.8 QUALITY CONTROL

- A. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 2. Notify testing agencies at least 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.

- a. 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.
- 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 revised or replaced Work that failed to comply with requirements established by the Contract Documents.
 1. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - a. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - b. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - c. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - d. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 - e. Do not perform any duties of Contractor.
 2. **Associated Services:** 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:
 - a. Access to the Work.
 - b. Incidental labor and facilities necessary to facilitate tests and inspections.
 - c. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - d. Facilities for storage and field-curing of test samples.
 - e. Delivery of samples to testing agencies.
 - f. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - g. Security and protection for samples and for testing and inspecting equipment at Project site.
 3. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - a. Schedule times for tests, inspections, obtaining samples, and similar activities.

4. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.
 - a. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 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 Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
 2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
 3. Protect construction exposed by or for quality-control service activities.
 4. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01400

SECTION 01410 - REFERENCES AND INDUSTRY STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The work of this Section applies to all Construction Contract Documents including drawings, Division 1 - Miscellaneous Requirements Sections, and Specifications Sections included in Part-2 through Part-6.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved:" The term "approved," when used to convey Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities.
- C. "Directed:" Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Architect, requested by Architect, and similar phrases.
- D. "Indicated:" The term "indicated" refers to graphic representations, notes, or schedules on Drawings or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.
- E. "Regulations:" The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish:" The term "furnish" means to supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install:" The term "install" describes operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide:" The term "provide" means to furnish and install, complete and ready for the intended use.
- I. "Installer:" An installer is the Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

- J. The term "experienced," when used with an entity, means having successfully completed a minimum of five 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, subject to verification by and approval of the Architect.
 - 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.
- K. "Project site(s)" is the space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
 - 1. 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 for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.

- E. Abbreviations and Acronyms for Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S." .

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01410

SECTION 01455 - CONCRETE IN-SITU RELATIVE HUMIDITY AND pH TESTING

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

- A. The General Construction Work Contractor shall engage and pay for a testing agency to provide in-situ concrete relative humidity and surface pH testing to all new and existing concrete specified to be covered with floor coverings or resinous coatings. Testing Agency shall be approved by the Architect / Owner. Includes concrete placed below, on and above grade.
- B. Testing shall take place after allowing concrete to dry for a minimum of 28 days.
- C. Testing to be scheduled no less than 1 nor more than 3 weeks prior to scheduled flooring installation.

1.2 RELATED SECTIONS:

- A. Section 03300 - Cast in Place Concrete slabs
- B. Section 03450 - Self-Drying Finishing Underlayment
- C. Section 09650 - Resilient Flooring

1.3 REFERENCES

- A. ASTM F-2170-11- Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In-Situ Probes
- B. ASTM F-710-11 - Standard Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.
- C. ASTM F-1869-11 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

1.4 SUBMITTALS

- A. Report all test results in chart form listing test dates, time, depth of test well, in-situ temperature, relative humidity and pH levels.
- B. List test locations on floor plans and show same on 8-1/2 x 11 Table and Location maps. Deliver results in duplicate for distribution to Architect and General Contractor.

1.5 QUALITY ASSURANCE

- A. Independent Testing Agency
 - 1. Certified by Test Apparatus Manufacturer for product use.
 - 2. I.C.R.I. (International Concrete Repair Institute) certified, or other agency with verifiable experience.
- B. Flooring Installers
 - 1. Certified and /or approved by Test Apparatus Manufacturer for product use.
- C. Digital "Reader" and calibrated relative humidity sensors.
 - 1. Factory-calibrated "Smart Sensors" using Touch-n-Sense™ technology.
 - 2. NIST-traceable factory calibration.
- D. Wide range pH paper, and distilled or de-ionized water.

PART 2 - PRODUCTS

2.1 MANUFACTURES

- A. Rapid RH® relative humidity and temperature sensor kit as manufactured by Wagner Meters; or approved equal.
- B. pH test paper as manufactured by Micro Essential Laboratory, or approved equal.

PART 3 - EXECUTION

3.1 QUANTIFICATION OF RELATIVE HUMIDITY AT 40% OF CONCRETE THICKNESS

- A. The test site should be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperature and humidity levels should be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions should be 75± 10°F and 50± 10% relative humidity. When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with the test report.

- B. The number of in-situ relative humidity test sites is determined by the square footage of the facility. The minimum number of tests to be placed is equal to 3 in the first 1,000 sq. ft. and 1 per each additional 1,000 square feet.
- C. Determine the thickness of the concrete slab, typically from construction documents.
- D. Utilizing a roto-hammer drill test holes to a depth equal to 40% of the concrete thickness*. (i.e.: 2" deep for a 5" thick slab, or 1½" deep for a 4" thick slab). Hole diameter shall not exceed outside diameter of the probe by more than 0.04". Drilling operation must be dry.
- E. Vacuum and brush all concrete dust from test hole.
- F. Insert a relative humidity probe (sensor) to the full depth of test hole. Place cap over probe.
- G. Permit the test site to acclimate, or equilibrate, for 1 to 2 hours prior to taking relative humidity readings.
- H. Remove the cap, insert the cylindrical reading device, and press button on the device to obtain reading from the in-situ probe.
- I. Read and record temperature and relative humidity at the test site.

* Elevated structural slab (not poured in pans) should be tested at a depth equal to 20% of its thickness.

3.2 QUANTIFYING pH LEVEL

- A. At or near the relative humidity test site perform pH test.
 - 1. Place several drops of water onto the concrete surface to form a puddle approximately 1" in diameter.
 - 2. Allow the water to set for approximately 60 seconds.
 - 3. Dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine pH reading
- B. Record and report results to the Architect and the General Contractor.

END OF SECTION 01455

SECTION 01505 - TEMPORARY FACILITIES

1.1 RESPONSIBILITIES OF CONTRACTOR

A. Contractor is responsible for the following temporary facilities and services:

1. Installation, operation, maintenance and removal of each temporary facility usually considered as its own normal construction activity.
2. Plug in electric cords, extensions cords, supplementary plug in task lighting and special lighting necessary exclusively for his/her own activities.
3. His/Her own storage and fabrication sheds.
4. All hoisting requirements for his/her work.
5. Collection and disposal of debris, hazardous, unsanitary or other harmful waste material from their operations, on a daily basis to trash receptacles, hoppers, containers, dumpsters, etc. furnished by the Contractor.
 - a. **Refer to Section 01050 - Alterations, Cutting, Patching and Refinishing Work which identifies the responsible Contractor for the collection and disposal of debris and Section 01524 - Construction Waste Management for additional information.**
6. Six foot (6'-0") high site enclosure fence, including maintenance and any gates needed. Provide fence relocations as needed during construction.
7. The secure lockup of his/her own tools, materials and equipment.
8. Construction aids and miscellaneous services and facilities necessary exclusively for his/her own construction activities.
9. Temporary storage provisions for work, including offsite provisions, if required.
10. Containerized bottled drinking water units for his/her personnel.
11. Fire protection provisions related to work including fire extinguishers.
12. All personnel safety equipment and provisions for his/her personnel.
13. Environmental protections.
14. Dust and fume control
15. Tree and plant protection.

16. Other temporary facilities and services stated as their responsibility elsewhere in the Project Documents.
17. Temporary toilets in sufficient quantity to suit project needs and including disposable supplies.

1.2 COMPRESSED AIR

- A. Contractor shall furnish his/her own equipment and energy source to provide compressed air required for the completion of work under his/her contract.

1.3 REMOVAL AND RESTORATION OF TEMPORARY FACILITIES

- A. At the completion of the work prior to final payment, Contractor shall remove temporary facilities and work which he/she has been responsible. Refer to Section 01700 for additional requirements.

1.4 UTILITY CONSUMPTION

- A. The Owner shall be responsible and pay all utility costs for electric and water consumption during the construction period.

END OF SECTION 01505

SECTION 01524 - CONSTRUCTION WASTE MANAGEMENT

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 administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Sections include the following:
 - 1. All of Division 1 and attached specifications and drawings that make a part of this contract.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

1.4 SUBMITTALS

- A. Waste Management Plan: Submit 4 copies of plan within 30 days of date established for the Notice to Proceed.

- B. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- C. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- D. 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.
- E. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Qualification Data: For refrigerant recovery technician.
- G. 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.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 1. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, and waste reduction work

plan. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 2. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 4. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Owner / Architect. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with Division 1 Section "Temporary Facilities" for operation, termination, and removal requirements.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Sale and Donation: Not permitted on Project site.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area.
 4. Store components off the ground and protect from the weather.
 5. Remove recyclable waste off Owner's property and transport to recycling receiving or processor.

3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials on-site.

C. Burying: Do not bury waste materials on-site.

D. Disposal: Transport waste materials off Owner's property and legally dispose of them.

E. Washing waste materials into sewers or drains is not permitted.

END OF SECTION 01524

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The work of this Section applies to all Construction Contract Documents including drawings, Division 1 - Miscellaneous Requirements Sections, and Specifications Sections included in Part-2 through Part-6.

1.2 SUMMARY

- A. Section Includes:
 - 1. General product requirements, including:
 - a. General specification requirements for all products.
 - b. General requirements and procedures for maintenance materials and tools.
 - 2. General requirements for product documentation, including:
 - a. Requirements and procedures for schedule of products.
 - b. General requirements for operation and maintenance data.
 - 3. General procedures for products including:
 - a. Procedures for transportation and handling.
 - b. Procedures for delivery and receiving.
 - c. Procedures for storage.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Components required to be supplied in quantity within a specification section shall be identical, interchangeable, and made by the same manufacturer.
- B. Do not use products removed from existing construction.

2.2 MAINTENANCE MATERIALS AND TOOLS

- A. Maintenance Materials: Parts and materials for repair and maintenance; specific items required are specified in product sections.
 - 1. Provide products and tools which are identical to those used in the work; if necessary to obtain identical items, order at the same time as products to be installed or tools to be used in the work.
- B. Package appropriately and label to show type and quantity of contents.

- C. Deliver, handle, and store in the same manner as products to be installed.
- D. Do not turn over to the Owner until date of substantial completion, unless otherwise approved by the Owner.
- E. Deliver to the Owner; unload.
- F. Obtain receipt prior to final payment.

PART 3 - EXECUTION

3.1 PRODUCTS

- A. It is the Contractor's responsibility to select products which comply with the contract documents and which are compatible with one another, with existing work, and with products selected by other Contractors.
 - 1. Verify that electrical characteristics of products are compatible with electrical systems; notify architect of all discrepancies.
 - 2. Where visual matching to an established physical sample is required, the Architect's decision will be final.
- B. Do not use any substitute products which have not been approved in accordance with the requirements of the contract documents.
- C. Where the specification is silent on whether substitutions will be considered, substitutions will be considered only when submitted in accordance with AIA A201 and Section 00800.
- D. Products Specified by Reference Standard: Use any product meeting the specification. Provisions of reference standards shall not modify the responsibilities of the Owner or Architect as defined in the contract documents.
- E. Products Specified by Performance Requirements: Use any product meeting the specification.
- F. Products Specified to Match a Physical Sample: Use any product that matches; obtain the Architect's approval.
- G. Products Specified by Listing a Brand Name Product(s) made by listed Manufacturer(s) as the "Basis of Design":
 - 1. Pursuant to N.J.S.A. 18A:18A-15(d) indicated basis of design brand name product(s) or equivalent made by one of the manufacturers listed will be acceptable, as determined by the Architect.

- H. Products Specified by Listing Brand Name Product(s) Accompanied by Language Indicating that Substitutions Are Allowed: Provide a product meeting the specification; submit substitution request for any brand-name product, that is not listed, in accordance with AIA A201 and Section 00800.
- I. Products Specified by Listing Manufacturer(s): Provide a product meeting the specification and made by one of the manufacturers listed or an approved equal. Approval of substitutions will be in accordance with AIA A201 and Section 00800.
- J. Unless specified or noted otherwise in the Contract Documents and/or approved submittals, all Work is to be performed in accordance with the respective material Manufacturer's printed installation instruction. Work installed in variance with the Contract Documents, Approved Submittals and Manufacturer's printed installation instructions will be rejected, removed and replaced by the Contractor and at no additional cost to the Owner.

3.2 SCHEDULE OF PRODUCTS

- A. Prepare a complete schedule of products used, including the following for each product:
 - 1. Manufacturer's name.
 - 2. Brand or trade name.
 - 3. Model number, if applicable.
 - 4. Reference standard, if more than one is applicable.
 - 5. Arrange products in the schedule by specification sections; indicate paragraph where specified.
- B. Prepare and submit a preliminary schedule within 15 working days after award of contract; resubmit when revised; submit final schedule prior to final payment. See additional requirements and milestone dates in Section 01800.
- C. Schedule of products shall not be used to obtain approval of substitute products; make separate request for substitution.

3.3 OPERATION AND MAINTENANCE DATA

- A. Provide operation and maintenance data as specified in individual product sections.
 - 1. Provide data sufficient for operation and maintenance by Owner without further assistance from the manufacturer.
 - 2. Provide completed data in time for use during Owner instruction.

- B. Data Required For Products - General:
 - 1. Name of manufacturer and product.
 - 2. Name, address, and telephone number of subcontractor or supplier.
 - 3. Local source of replacements.
 - 4. Local source of replaceable parts and supplies.
- C. Product Data: Where product data is specified for inclusion in operation and maintenance data, provide manufacturer's data sheets marked to indicate specific product and product options actually installed; delete inapplicable data.
- D. Project Record Documents: Provide an additional copy of applicable record documents for inclusion with the operation and maintenance data.
- E. Coordination Drawings: When coordination drawings are prepared, include a copy with the operating and maintenance data.
- F. Custom Manufactured Products: Provide all information needed for reordering.
- G. Finish Materials: Manufacturer's product data, color/texture designations, and manufacturer's instructions for care, cleaning, and maintenance.
- H. Products Exposed to Weather and Products for Moisture Protection: Manufacturer's product data, recommended inspection schedule and procedures, maintenance and repair procedures, and maintenance materials required.
- I. Equipment: Provide at least the following information:
 - 1. Product data giving equipment and function description, with normal operating characteristics and limiting conditions.
 - 2. Starting, operating, and troubleshooting procedures.
 - 3. Cleaning and maintenance requirements and procedures.
 - 4. External finish maintenance requirements.
 - 5. List of maintenance materials required.
 - 6. List of special tools required.
 - 7. Parts list: List all replaceable parts, with ordering data.
 - 8. Recommended quantity of spare parts to be maintained in storage.

- J. Systems: Provide overall function description, with diagrams, prepared especially for this project.
- K. Form of Data: Prepare data in the form of an instructional manual.
 - 1. Arrange contents logically, using section numbers and sequence of sections indicated on the table of contents of this project manual.
 - 2. When multiple volumes are used, arrange by related subjects; identify contents in cover title.
 - 3. Assemble into 3-ring binders with maximum 2-inch ring size.
 - a. Hardback, cleanable plastic covers.
 - b. Identify each book with title "Operation and Maintenance Instructions" and project name.
 - c. Page size 8-1/2 by 11 inches, maximum.
 - d. Prepare special typewritten data on minimum 20-pound paper.
 - e. Provide tabbed divider for each product and system.
 - f. Drawings: Bind in with other data; provide reinforced binding edge; fold larger drawings to size of pages.
 - 1) Do not use pockets or loose drawings.
 - 4. Provide table of contents for each volume listing:
 - a. Name of the project.
 - b. Name, address, telephone number, and contact name of:
 - 1) Architect.
 - 2) Contractor.
 - c. Index of products and systems included in volume.

3.4 TRANSPORTATION AND HANDLING

- A. Require supplier to package finished products in a manner which will protect from damage during shipping, handling, and storage.
- B. Transport products by methods which avoid damage.
- C. Deliver in dry, undamaged condition in manufacturer's unopened packaging.
- D. Provide equipment and personnel adequate to handle products by methods which prevent damage.
- E. Provide additional protection during handling where necessary to prevent damage to products and packaging.
- F. Lift large and heavy components at designated lift points only.

3.5 DELIVERY AND RECEIVING

- A. Arrange deliveries of products to allow time for inspection prior to installation.
- B. Coordinate delivery to avoid conflict with the work and to take into account both the conditions at the site and the availability of personnel, handling equipment, and storage space.
- C. Clearly mark partial deliveries to identify contents, to permit easy accumulation of entire delivery, and to facilitate assembly.
- D. Promptly inspect shipments and remedy damage, incorrect quantity, incompleteness, improper or illegible labeling, and noncompliance with requirements of contract documents and approved submittals.

3.6 STORAGE

- A. No indoor storage areas are available on-site.
- B. General Storage Procedures:
 - 1. Store products immediately on delivery.
 - 2. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
 - 3. Store in a manner to prevent damage to the stored products and to the work.
 - 4. Store moisture-sensitive products in weathertight enclosures.
 - 5. Store indoors if necessary to keep temperature and humidity within ranges required by manufacturer.
 - 6. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
 - 7. Arrange storage to provide access for inspection and inventory.
 - 8. Periodically inspect and remedy damage and noncompliance with required conditions.
- C. Loose Granular Materials: Store on solid surfaces in well-drained area; prevent mixing with foreign materials.
- D. Exterior Storage:
 - 1. Cover products subject to weather damage with impervious sheet covering; provide ventilation to avoid condensation.

2. Provide surface drainage to prevent runoff or ponded water from damaging stored products.
3. Prevent damage and contamination from refuse and chemically injurious materials and liquids.
4. Store fabricated products on substantial platforms, blocking, or skids above the ground, sloped to drain.

END OF SECTION 01600

SECTION 01700 - PROJECT CLOSEOUT DOCUMENTS AND PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The work of this Section applies to all Construction Contract Documents including drawings, Specifications, Division 1 - Miscellaneous Requirements Sections, and Specification Sections included in Part-2 through Part-6.

1.2 SUMMARY

- A. Section Includes:

1. Maintenance of Project Record Documents,
2. Record drawings, including As-Built drawings,
3. Record project manual (specifications),
4. Operation and Maintenance Manuals,
5. Warranties,
6. Extra Materials,
7. Submittals required prior to requesting for determining dates of substantial and final completion, and also prior to release of final payment(s),
8. Transmittal of Closeout Project Documents to the Owner,
9. Instructions of Owner's personnel,
10. Final Cleaning.

- B. GENERAL REQUIREMENTS

1. All submittals shall indicate reference to the appropriate Architect's Project Number.

- C. As-Built Drawings:

1. Full-size paper set.
2. Two (2) CD-Roms.

1.3 MAINTENANCE OF PROJECT RECORD DOCUMENTS

- A. Do not use record documents of any type for construction purposes.
- B. Maintain record documents in a secure location at the site while providing for access by the Contractor and the Architect during normal working hours; store in a fire-resistive room or container outside of normal working hours.
- C. Record information as soon as possible after it is obtained.
- D. Assign a person or persons responsible for maintaining record documents.
- E. Record the following types of information on all applicable record documents:
 - 1. Dimensional changes.
 - 2. New and revised details.
 - 3. Actual routing of piping and conduit.
 - 4. Revisions to electrical circuits.
 - 5. Actual equipment locations.
 - 6. Sizes and routing of ducts.
 - 7. Locations of utilities concealed in construction.
 - 8. Particulars on concealed products which will not be easy to identify later.
 - 9. Changes made by modifications to the contract; note identification numbers if applicable.
 - 10. New information which may be useful to the Owner, but which was not shown in either the contract documents or submittals.

1.4 RECORD AND AS-BUILT DRAWINGS

- A. During the progress of the installation, the Contractor shall keep a careful record of all changes and variations in the arrangement of his/her work from the layout shown on the Contract Drawings in order that the Owner may be provided with a complete set of all plans (As-Builts) showing the work as actually installed.
 - 1. The Contractor shall maintain complete two (2) sets of opaque prints of the contract drawings, marked to show changes which occur due to his/her work.

2. Where the actual work differs from that shown on the drawings, mark this set to show the actual work.
 3. Mark location of concealed items before they are covered by other work.
 4. Mark either record contract drawings or shop drawings, whichever are best suited to show the change.
 5. Where changes are marked on record shop drawings, mark cross-reference on the applicable contract drawing.
 6. When the Contractor is required by a provision of a modification to prepare a new drawing, rather than to revise existing drawings, obtain instructions from the Architect as to the drawing scale and information required.
 7. Keep drawings in labeled, bound sets.
 - a. Mark with red pencil.
 - b. Mark work of separate contracts with different colors of pencils.
 8. Incorporate new drawings into existing sets, as they are issued.
 9. Where record drawings are also required as part of operation and maintenance data submittals, make copies from the original record drawing set.
 10. As-Built Drawing Format to be submitted to the Architect:
 - a. One (1) complete, legible full-size paper (hard copy) As-Built drawing set with the following information on each page:
 - 1) Note: "As-Built" drawing,
 - 2) Contractor's Firm name,
 - 3) Date.
 - b. Two (2) copies, pdf format CD-Rom, scanned As-Built drawings of the hard copy furnished to the Owner (indicated above) shall be furnished to the Owner and the Architect and as directed by the Architect.
 11. Mechanical/ Electrical As-Built drawings must be submitted to the Engineer with a copy of the transmittal to the Architect. Approval must be obtained before issuing Final Certificate of Payment.
- B. Record drawings shall be provided for **all work** including but not limited to the following:
1. General Construction Work
 2. Plumbing and Drainage Work
 3. HVACR Work
 4. Electrical Work

1.5 PROJECT SPECIFICATION MANUAL

- A. The Contractor shall maintain a complete copy of the project specification manual, marked to show changes which occur due to his/her work.
- B. Where the actual work differs from that shown in the project manual, mark the record copy to show the actual work.
 - 1. Include a copy of each addendum and modification to the contract.
 - 2. In addition to the types of information required on all record documents, record the following types of information:
 - a. Product options taken, when the specification allows more than one.
 - b. Product substitutions.
 - c. Proprietary name and model number of actual products furnished, for each product, material, and item of equipment specified.
 - d. Name of the supplier and installer, for each product for which neither a product data submittal nor a maintenance data submittal was specified.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
 - 1. Operation Data:
 - a. Emergency instructions and procedures.
 - b. System, subsystem, and equipment descriptions, including operating standards.
 - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - d. Description of controls and sequence of operations.
 - e. Piping diagrams.
 - 2. Maintenance Data:
 - a. Manufacturer's information, including list of spare parts.
 - b. Name, address, and telephone number of Installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.
 - h. Copies of warranties and bonds.

- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.
- C. Operation and Maintenance Manuals must be submitted to the appropriate Engineer with a copy of the transmittal to the Architect. Approval must be obtained before issuing Final Certificate of Payment.
 - 1. Contractors shall submit electronic version of the MEP O&M manuals for review by the MEP Consultant. *Paper copies should not be submitted as part of the MEP review process.

1.7 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. 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 paper.
 - 2. 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.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 - 4. Warranty manual must be submitted to the Architect for review. Architect's approval must be obtained before issuing final payment.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.8 SUBMITTAL REQUIREMENTS - SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 2. Advise Owner of pending insurance changeover requirements.
 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. 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.
 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and digital images on CD Rom, damage or settlement surveys, and similar final record information.
 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 8. Complete startup testing of systems.
 9. Submit test/adjust/balance records.
 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 11. Advise Owner of changeover in heat and other utilities.
 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 13. Complete final cleaning requirements, including touch-up painting.
 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, 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.

1.9 SUBMITTAL REQUIREMENTS - FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 1. Submit a final Application for Payment according to the requirements of the Contract Documents.
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and signed by the Contractor.
 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. Provide statement signed by Owner's representatives stating that they have received the required training.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect 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.
 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected. The cost of additional inspections required by the Architect or his/her consultants or the Construction Manager due to Contractor's failure to complete the punch list will be paid by the Contractor and will be deducted from the Contractor's final payment.
- C. The Contractor is required to obtain all final releases from governmental and regulatory agencies having jurisdiction over the project with the assistance from the Architect / Engineer and Owner (if required).

1.10 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list to the Architect and Construction Manager. 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.

1. Organize list of spaces in sequential order, as applicable.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect and Construction Manager.
 - d. Name of Contractor.
 - e. Page number.

1.11 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's and Construction Manager's reference during normal working hours.
- B. Record Drawings: Maintain and submit one set of blue - or black-line white prints of Contract Drawings and Shop Drawings.
 1. 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 cannot be readily identified and recorded 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.
 - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 3. Mark important additional information that was either shown schematically or omitted from original Drawings.
 4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.

5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy 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. Note related Change Orders, Record Drawings and Product Data, where applicable.
- D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
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, Record Drawings, and Record Specifications, where applicable.
- E. Miscellaneous Record Submittals: 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.

1.12 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
1. Provide instructors experienced in operation and maintenance procedures.
 2. Provide instruction at mutually agreed-on times.

3. Schedule training with Owner, through Architect and Construction Manager, with at least seven calendar days advance notice.
 4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required, by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
1. System design and operational philosophy.
 2. Review of documentation.
 3. Operations.
 4. Adjustments.
 5. Troubleshooting.
 6. Maintenance.
 7. Repair.

1.13 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
1. Refer to other Division 1 - specification sections for additional cleaning as required and where applicable.
- B. Cleaning: 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.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. 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.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. 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.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Clean transparent materials, including glass in doors. Replace chipped or broken glass and other damaged transparent materials. Polish glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. 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.
 - (1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - l. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Replace parts subject to unusual operating conditions.
 - n. Plumbing Work Subcontractor shall clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Heating, Ventilating Air Conditioning Work and Refrigeration Subcontractor shall replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - 1) Clean ducts, blowers, and coils if units were operated without filters during construction.
 - p. Electrical Work Subcontractor shall clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - q. Leave Project clean and ready for occupancy.
 - r. 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.

1.14 TRANSMITTAL TO OWNER

- A. Collect, organize, label, and package ready for reference.
 - 1. Provide cardboard file boxes for submittals.
 - 2. Provide cardboard drawing tubes with end caps for transparencies.
 - 3. Bind print sets with durable paper covers.

4. Label each document (and each sheet of drawings) with "PROJECT RECORD DOCUMENTS - This document has been prepared using information furnished by _____" [insert the contractor's name], and the date of preparation.

B. Submit to the Architect for transmittal to the Owner, unless otherwise indicated.

1.15 REMOVE TEMPORARY FACILITIES

A. At the completion of the work prior to final payment, remove all temporary facilities entirely from the site, including, but not limited to, the following:

1. Trailers, temporary toilets, temporary enclosures, dust barriers and other temporary protection devices.

1.16 SUBMITTALS REQUIRED PRIOR TO FINAL PAYMENT

A. Contractor(s) must satisfy all requirements of Sections 01700 and 01900 prior to submitting for Final Payment.

B. A closeout checklist will be provided to the Contractor when he/she is substantially complete. The Contractor is instructed to mark each submittal with the corresponding item number on the checklist. All warranties must have the Owner Name, Project Name, Architect Project Number and Warranty Periods. If all documents are not received in this format, the submittal will be rejected and the Contractor will be instructed to pick these documents up at the Architect's office for correction.

C. Submittals required prior to final payment shall be in accordance with "Checklist" include, but are not limited to, the following items:

1. Completed Operations Insurance Certificate - ACORD Form.
2. Affidavit of Payment of Debts and Claims - AIA Document G706.
3. Affidavit of Release of Liens - AIA Document G706A.
4. Consent of Surety Company to Final Payment - AIA Document G707.
5. Certification of Wages in accordance with New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56.25 et seq.
6. 10% two year Maintenance Bond on the form provided in this specification.
7. Manufacturers' product warranties, Special written guarantees and warranties, maintenance warranty, etc. in accordance with Section 01900, various specification sections and the table of contents of the Project Manual. This is

- in addition to the one-year guarantee covered by the Maintenance Bond and in addition to the Contractor's one-year guarantee.
- a. Guarantee shall be signed and sealed by Officer of the Contracting Firm and shall be notarized.
8. Project Record Drawings, (As-Built Drawings), Record Specifications, Record Product Data, and Miscellaneous Record Submittals.
 - a. Note: As-Built Drawings shall be submitted to the Engineer / Architect.
 9. Operation and Maintenance Manuals and Instructions.
 - a. Note: Operation and Maintenance Manuals shall be submitted to the Engineer / Architect.
 10. Balancing Reports for Heating, Ventilating, Air Conditioning and Refrigeration systems.
 11. Certificate of Occupancy / Copies of all Building Department inspection approvals.
 12. In accordance with requirements of N.J.S.A. 52:32-44. Contractor must submit accurate list of all subcontractors and suppliers. Contractor must provide a certification that all proofs of business registration for all subcontractors and suppliers are maintained on his/her file.
 13. All approvals and final releases from governmental and regulatory agencies have jurisdiction including, but not limited to: NJDCA, Local Construction Department, NJDEP, etc., as required.

END OF SECTION 01700

CLOSEOUT CHECKLIST

Owner		
Title		
Project #		Contract:
Contractor		
Substantial Completion Date:		Updated:
Refer to Specification Sections 01700 and 01900 for closeout requirements.		
Item No.	Documents & Warranties Required For Closeout	Status
1	Completed Operations Insurance Certificate - ACORD Form	
2	Completed Operation Insurance Statement (Sample Enclosed)	
3	AIA Document G704 Certificate of Substantial Completion	
4	AIA Document G706 Affidavit of Payment of Debts & Claims	
5	AIA Document G706A Affidavit of Release of Liens	
6	AIA Document G707 Consent of Surety to Final Payment	
7	Certification that all wages have been paid - NJ Prevailing Wage Act, N.J.S.A. 34:11-56.25	
8	10% two-year Maintenance Bond - must be on form provided in spec book - sample attached	
9	Record Project Manual indicating changes or company letter stating no changes.	
10	Two Year Contractor's Guarantee Covered by Maintenance Bond - Sample Attached	
11	Operation Instructions & Maintenance Manuals (2 each in 3-ring binder)	
12	Record Drawings. Indicate As-Built drawings with company name, address and date (1 Paper Set & 2 CD's)	
13	Final Payment Requisition & Board Voucher/Invoice (3) Contractor will not be closed out until all paperwork is submitted	
14	Certificate of Approval/Acceptance	
15	Confirmation that FVHD has received "hard copies" (not electronic) of all shop drawing submittals.	
16	Copies of all outstanding certified payroll reports or letter on Contractor's letterhead stating all outstanding certified payroll sheet and manning reports have been sent to the Owner.	
17	Letter on Contractor's letterhead stating date of substantial completion and requesting punch list review to Architect & Engineer	
18	Final Punch list signed and dated indicating completion of all work	
19	Submit accurate list of all subcontractors and suppliers and provide a certification that all proofs of business registration for all subcontractors and suppliers are maintained on his/her file.	
20	Balancing & Testing Reports (HVAC)	
21	Fire Alarm Certification (ELECTRICAL)	
22	Warranties - Refer to Specification Section 01900 for required warranties for each trade	

SECTION 01800 - TIME OF COMPLETION AND LIQUIDATED DAMAGES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes the requirements for completion of interim milestone events and final completion of all work required by the contract documents.
- B. Related Sections:
 - 1. Items of Work attached to the "Certificate of Substantial Completion" and establishing "Final Completion Time" as per Section 00800.
- C. This section also establishes the relation of liquidated damages for failure to complete the interim milestone events or final completion requirements within the time requirements stated herein.
- D. **The building (or part of the building) will be occupied at all times. The Contractor shall maintain heat, electric, fire safety systems and emergency egress paths, control dust and water infiltration at all times.**

1.2 TIME FOR COMPLETION

- A. It is understood that the Prime Contractor is responsibility to complete its work in sequence with the work of the other Contractor(s) and to allow the other Contractor(s) access to the work site so that they may complete their work within the times established.
- B. Completion of the Contract Work by the Contractor shall be time of the essence.
- C. The Contractor shall work overtime, additional shifts, weekends or holidays to complete the work on time with no additional cost to the Owner.
 - 1. Scarce resources will be no excuse for not completing the work on time.
 - 2. **No work may take place during the school day in any occupied area. All work, in occupied areas, shall be performed on second shift (3:00 PM - 11:00 PM) until June 20, 2024 and after August 30, 2024 through October 25, 2024. Only limited / selective work is permitted. Contractor must review proposed work activities and have approval of Owner and Architect prior to proceeding.**
 - 3. **Work may take place during regular shift and second shift (7:00 AM - 10:00 PM) after June 20, 2024 until August 30, 2024; however, the Contractor is required to review and coordinate all work activities with the Architect and School Facilities Director prior to commencing with the work.**
 - a. **Contractor to review permitted work hours to comply with the local "Noise Ordinance".**

4. **Contractor is required to include the cost of any premium time, second shift and weekend work which may be required in their bid to complete the work within the indicated milestone dates.**
- D. Substantial and final completion of the Work shall include but is not limited to final inspection and acceptance by the Local Building Officials.

1.3 SEQUENCE OF CONSTRUCTION

- A. In order to allow the Prime Contractor and Subcontractor(s) to understand the requirements of the Project, the following general sequence of construction Work will be followed:
1. Generally, the General Construction Contractor is to schedule, sequence and coordinate the Work with Prime Subcontractors, as required, to logically progress the Work, meeting the overall design intent, construction quality and time of completion. **Schedule inspections and obtain required approvals of all stages of the Work as required by the Local Construction Officials.**
 2. Proper scheduling of the Work includes timely sequencing, preparation, review and approval by the Prime Contractor and **submission of requisite technical and other project submittals and shop drawings** to the Architect / Engineer for approval to advance the proper, logical progression of the Work.
 3. After mobilization and securing the work site, the General Construction Work Contractor is to perform selective demolition of existing general building construction, layout and coordinate the proposed new building construction with existing construction to remain, as noted on the Construction Drawings.
 - a. Apply for and obtain demolition permit to allow commencement of the Work while permit applications for new Construction are under review by the Construction Official.
 4. All Subcontractors are mutually responsible to coordinate their Work with the general construction for installation of Plumbing, Drainage, HVAC and Electrical **rough-in construction Work below and in floor slabs, interior walls.**
 5. Progress the Work of all Trades towards completion, as required, by the Contract Documents to obtain **Substantial Completion** including, inspection and testing by local construction officials, commissioning, testing and balancing of the HVAC, Automatic Temperature Controls, Plumbing and Electrical Work to obtain the Certificate of Occupancy.
 6. Provide written formal notification of **Substantial Completion** to the Architect / Engineer and request Punch-List Observations.

7. Complete proper preparation, review and approval by the Prime Contractor and submission of all Close-out Documents, Operation and Maintenance Manuals, As-built surveys and drawings to the Architect / Engineer within contract time required to achieve **Final Completion**.

1.5 PROJECT CONTRACT MILESTONE DATES

A. TIME OF COMPLETION

1. Milestone No. 1

- a. Sign Contract, no later than **twenty (20)** calendar days, Sundays and Holiday's excepted, from **Notice of Award**; on or about **November 17, 2023**.
- b. Contractor submits Bonds and Insurance **ten (10) calendar days from Notice of Award, Sundays and holidays excepted**.
- c. **Notice to Proceed** shall be within **three (3) business days** of date of signing Contract; on or about **December 14, 2023**.

2. Milestone No. 2

- a. **Time Critical submittals** for special equipment, fixtures, etc. shall be submitted within **twenty (20) calendar days from Notice to Proceed**.

3. Milestone No. 3

- a. Submission of all remaining technical shop drawing submittals shall be submitted within **thirty (30) calendar days from Notice to Proceed**.

4. Milestone No. 4

- a. Physical work at the site shall commence on or about **June 24, 2024**.

5. Milestone No. 5

- a. Substantial Completion of the entire project shall be on or before **317 Calendar Days from the Notice to Proceed, October 25, 2024**.
- b. Liquidated Damages - \$1,000.00 / Calendar day of delay.

6. Milestone No. 6

- a. Final Completion of all Work including punch list items and closeout documents, no later than **31 Calendar Days from Substantial Completion, November 25, 2024**.
- b. Liquidated Damages - \$1,000.00 / Calendar day of delay.

1.6 LIQUIDATED AND OTHER DAMAGES

- A. By bidding the Project, the Contractor is accepting that the time allotted for the completion of Work is reasonable. Completion of Work on or about these milestones are prerequisites for the coordinated Work of all Contractors. When the Owner will suffer financial loss and/or extra cost if a milestone task is not completed within the allotted time, the Contractor responsible for the delay in achievement of each

milestone, as determined by the Owner's Project Manager and the Architect, shall pay to the Owner a fixed, agreed sum as liquidated damages for each calendar day of delay until the milestone task is substantially completed.

- B. The Liquidated Damages set for above shall be in addition to other consequential losses or damages the Owner may incur by reason of such delay, such as, but not limited to, the cost of additional architectural and engineering, independent third party inspection and other services resulting from the delay, additional costs to the Owner for payments to other Contractors resulting from delay.
- C. Liquidated Damages are fixed and agreed upon by and between the Contractor and the Owner because of the impracticality and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amounts shall be retained from time to time by the Owner for the current periodical payments.
 - 1. The Liquidated Damages set for above are intended to compensate Owner for loss of use during the period of delay, for other delay during construction which may result further delay in substantial and/or final completion dates and for any acceleration costs by other contractors to recover the defaulting contractor's delay.
 - 2. In no way shall costs of Liquidated Damages be construed as a penalty to the Contractor.
- D. The Owner shall have the right to deduct the total amount any Liquidated Damages for which the Contractor may be liable from any monies otherwise due the Contractor, including any retainage under control of the Owner.
- E. The Surety providing the Performance Bond, furnished by the Contractor, will be liable for Liquidated Damages assessed against the Contractor, to the extent that the Contractor shall not make settlement thereof with the Owner.
- F. The Contractor agrees that in the event the Owner is required to incur or advance any additional necessary and reasonable costs (including but not limited to Architect, Attorney or other fees related expenses), as a result of the failure of the Contractor to perform any obligation of this Contract or to perform its obligations in a timely manner as required by the Contract Documents, the Contractor agrees that such additional necessary and reasonable costs shall be borne by the Contractor and may be deducted by the Owner from any payment due the Contractor.
- G. In accordance with N.J.S.A. 18A:18A-19, the Owner shall deduct from the Contract Price, for any wages paid by the Owner to any inspector or inspectors necessarily employed by for the work of this project, for any number of days in excess of the number of days or indicated dates allowed in milestones above. Such sums shall be part of the Liquidated Damages indicated herein after.

END OF SECTION 01800

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SECTION 01900 - GUARANTEES AND WARRANTIES

PART 1 - GENERAL

1.1 CONTRACT

- A. Period for all guarantees and warranties shall commence at date of substantial completion for the entire project, as determined by the Architect.
- B. The Contractor's guarantee on all work, covered by Maintenance Bond. . . **One (1) Yr.**
 - 1. The Maintenance Bond shall represent a continuing obligation of the Prime Contractor and his/her Subcontractor(s) to repair/replace defective materials and/or labor of products installed in the project for **one (1) year** from the date of Substantial Completion.
- C. Provide all required warranties indicated in specification sections which include but not limited to the following:

1.2 GENERAL CONSTRUCTION WORK

- A. Self-Drying Finishing Underlayment as specified in Section 03452. (Trowel)
 - 1. Special Project Warranty: Submit a written warranty signed by the manufacturer, the contractor, and the installer, guaranteeing to correct failures in materials and workmanship which occur within the warranty period, including those attributable to abnormal aging, without reducing or otherwise limiting any other rights to correction which the Owner may have under the contract documents.
 - a. The warranty shall include responsibility for removing and replacing other work as necessary to accomplish repairs or replacement of materials covered by the warranty.
 - 1) Warranty period: Minimum **two (2) years** after date of substantial completion.
- B. Unit Masonry Work as specified in Section 04200.
 - 1. The Contractor shall warrant the exterior walls to be free from leakage due to any natural cause for a period of **five (5) years** from date of final acceptance of the building and he/she shall, within such period at his/her own expense, upon written notification from the Owner, pursue such remedial measures as may be necessary to correct any condition of leakage and damage incidental thereto that may develop. The Contractor in signing this Contract accepts the above conditions. In so doing, he/she also agrees either that the materials and methods specified herein are such as to insure the results required or that he/she will, at no additional expense, furnish such additional or alternative items of labor and materials (or both) as may be necessary to accomplish the stated intent of the Contract.

2. Flexible Copper Flashing:
 - a. Special warranty:
 - 1) Manufacturer shall warrant flexible flashing material for **life of the wall**.
 - 2) Begin warranty from the Date of Substantial Completion.
- C. Solid Polymer Fabrications as specified in Section 06650.
 1. Provide manufacturer's warranty against defects in materials, fabrication and installation, excluding damages caused by physical or chemical abuse or excessive heat. Warranty shall provide for replacement or repair of material and labor for a period of **ten (10) years**, beginning at Date of Substantial Completion.
 - a. For fabrications with installed warranty coverage, identify by affixing manufacturer's fabrication/installation source plate.
- D. Fluid Applied Air / Vapor Barriers as specified in Section 07270.
 1. Manufacturer's Single Source Warranty:
 - a. Fluid Applied Air and Vapor Barrier:
 - 1) Product Warranty: Manufacturer warrants the material against product defect for a period of **five (5) years** from date of purchase.
- E. Agreement to Maintain Roofing
 1. Roofing Contractor shall agree to maintain the roof systems and related roof sheet metal work in a weathertight and watertight condition for a period of **two (2) years** starting from the date of Owner's acceptance in accordance with special Maintenance Contract outlined herein.
 2. During the Maintenance Period, the Roofing Contractor agrees that within 24 hours of receipt of notice from the Owner he/she will inspect and make immediate emergency repairs to defects or to leaks in the roof systems and related flashing work. He/She further agrees that within a reasonable time, he/she will restore the affected items to the standard of the original specifications. All emergency and permanent work during the life of the agreements to maintain the roof systems will be done without cost to the Owner, except in the event it is determined that such leaks were caused by abuse, lightning, hurricanes, tornado, hailstorm, other unusual climatic phenomena of the elements, or failure of related work (except related roof sheet metal work included under the Agreement) installed by other parties.
 3. Agreement to maintain roofing system shall be in a written form acceptable to the Owner.
- F. Joint Sealer Assemblies as specified in Section 07900.
 1. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - a. Warranty Period: **Five (5) years** from date of Substantial Completion.

2. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - a. Warranty Period: **Five (5) years** from date of Substantial Completion.
 - b. Submit two (2) copies of written guarantee for all sealant work of this section signed by the Contractor and the sealant manufacturer for a period of **five (5) years** from the date of acceptance by the Owner.
 - c. Guarantee shall further state that all exterior sealant will be guaranteed against:
 - 1) Adhesive or cohesive failure in joints where movement is under maximum 25% extension or compression.
 - 2) Any crazing greater than 3 mils in depth developing on surface of material.

G. Wood Doors as specified in Section 08211 **Life of Installation.**

1. Submit written agreement in door manufacturer's standard form signed by the manufacturer and contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or which show photographing of construction below its face veneers, or do not conform to tolerance limitations of NWMA.
2. The warranty shall also include refinishing and reinstallation as may be required due to repair or replacement of defective doors.

H. Alum./FRP Doors and Alum. Framing System as specified in Section 08410.

1. Provide written warranty signed by Manufacturer and Contractor, agreeing to replace aluminum entrances which fail in materials or workmanship within **ten (10) years** of acceptance. Failure of materials or workmanship includes excessive leakage or air infiltration, excessive deflections, faulty operation of entrances, deterioration of finish or construction in excess of normal weathering, and defects in hardware, weatherstripping and other components of the work.

I. Aluminum Storefronts as specified in Section 08415.

1. Special Warranty: Submit a **ten (10) year** written warranty executed by the manufacturer agreeing to repair or replace components of entrance and storefront systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Adhesive sealant failures.
 - c. Cohesive sealant failures.
 - d. Failure of system to meet performance requirements.
 - e. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - f. Failure of operating components to function normally.
 - g. Water leakage through fixed glazing and frame areas.

- J. Finish Hardware as specified in Section 08700.
 - 1. Guarantee workmanship and material provided against defective manufacture. Repair or replace defective workmanship and material appearing within period of **one (1) year** after substantial completion.
 - 2. Conventional Exit Devices: Exit devices shall have a **five (5) year** warranty.
 - 3. Door Closers: Heavy duty surface mounted door closers shall have a **thirty (30) year** warranty.

- K. Glass and Glazing as specified in Section 08800.
 - 1. Manufacturer's Special Warranty on Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for those coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - a. Warranty Period: **Ten (10) years** from date of Substantial Completion.
 - 2. Fabricator's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass fabricator agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - a. Warranty Period: **Ten (10) years** from date of Substantial Completion.
 - 3. Manufacturer's Limited Warranty on Fire-Rated / Impact Glazing: Written warranty, made out to the Owner and signed by manufacturer, warrants only that the product will be free of manufacturing defects resulting in material obstruction through the glass area and/or edge separation and changes in properties of the interlayer for a period of **five (5) years** from the date of purchase, provided the Products have been properly shipped, stored, handled, installed and maintained.
 - a. Limitation of Remedy - Inspection: The remedy for product proved to be defective under the terms of this warranty is limited to shipment of replacement product. With respect to all claims under this warranty, the Manufacturer shall have the right to inspect any and all products alleged to be defective.

- L. Acoustical Ceilings and Suspension System as specified in Section 09510.
 - 1. Special Manufacturer's Warranty: Written warranty, signed by the ceiling manufacturer agreeing to furnish ceiling materials and replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 2. Warranty Period: **Thirty (30) year** System Performance Guarantee against visible sag, Mold/Mildew and Bacteria Growth.

M. Resilient Flooring as specified in Section 09650.

1. Vinyl Composition Tile:
 - a. Special Warranty - Manufacturer warrants its regular (first quality) commercial floor products to be free from manufacturing defects for **five (5) years** from date of purchase.
 - 1) **Within One Year**: If a defect covered by this warranty is reported to the manufacturer in writing within one year of purchase, Manufacturer will supply new material of the same or similar grade sufficient to repair or replace the defective material. Manufacturer will also pay reasonable labor costs.
 - 2) **Within Two Years**: If a defect covered by this warranty is reported to the manufacturer in writing after one year but within two years of purchase, Manufacturer will supply new material of the same or similar grade sufficient to repair or replace the defective material. Manufacturer will also pay fifty (50%) percent of reasonable labor costs.
 - 3) **After Two Years**: If a defect covered by this warranty is reported to the manufacturer in writing after two years but within five years of purchase, Manufacturer will supply new material of the same or similar grade sufficient to repair or replace the defective material. Manufacturer will not pay for labor costs.
 - 4) Manufacturer does not warrant the installers' workmanship. Workmanship errors should be addressed to the contractor who installed the floor.
2. Static Dissipative Vinyl Composition Tile Flooring (VCT-NC).
 - a. Manufacturer's standard minimum **one (1) year** for labor and material warranty from date of Substantial Completion.

N. Dry Marker Boards / Exhibition Boards as specified in Section 10100.

1. Submit a "**Life of Building**" warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer's instructions and recommendations, porcelain enamel steel markerboard writing surfaces are guaranteed for the Life of the Building. Guarantee covers replacement of defective boards, but does not include cost of removal or reinstallation.
2. Submit a standard warranty, stating that when installed in accordance with manufacturer's instructions and recommendations, exhibition boards are guaranteed for **one (1) year** against defects in materials and workmanship. Guarantee does not cover normal wear and tear, improper handling, any misuse, or any defects caused by vandalism or subsequent abuse. Guarantee covers replacement of defective material, but does not include cost of removal or reinstallation.
3. Writing Surface Warranty Period: Lifetime of the building commencing on the Date of Substantial Completion.

O. Window Treatment as specified in Section 12496.

1. Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-depreciating, transferrable warranty for interior shading. Provide manufacturer's standard warranties, including the following:
 - a. Shade Hardware - **Ten (10) years** unless otherwise indicated:
 - 1) ElectroShade with ThermoVeil, EuroTwill, Soho, Equinox, Midnite, Chelsea, or Classic 1) Blackout shade fabric: **Twenty-five (25) years**.
 - b. Standard Shadecloth: Manufacturer's standard **twenty-five (25) year** warranty.
 - c. Roller Shade Motors, Motor Control Systems, and Accessories: Manufacturer's standard non-depreciating **ten (10) year** warranty for AC motors and controls
 - d. Roller Shade Installation: **One (1) year** from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas, which are deemed owners responsibility.
 - e. Roller Shade EDU's and EDU Control Systems: Manufacturer's standard non-depreciating **five (5) year** warranty.
 - f. Roller Shade Installation: **One (1) year** from date of Substantial Completion, not including scaffolding, lifts or other means to access to the work above 12' feet AFF, which are the responsibility of others.

1.3 CASEWORK AND EQUIPMENT WORK

A. Casework (Solid Wood) as specified in Section 11011.

1. Manufacturer shall warrant the casework to be free from defects in materials and workmanship, under normal use and service, for **three (3) years** from date of delivery.
 - a. Within the warranty period, manufacturer shall repair, replace, or refund the purchase price of defective casework.

1.4 PLUMBING & DRAINAGE WORK

A. General Requirements Plumbing as specified in Section 220010.

1. Unconditionally guarantee in writing all materials, equipment and workmanship for a period of **one (1) year** from date of acceptance by Owner. During the guarantee period, repair or replace, at the Plumbing Trade Contractor's expense, any materials, equipment or workmanship in which defects may develop and provide free service for all equipment and systems involved in the contract during this guarantee period. Beneficial use of any system by the any of the Trade Contractors during construction does not constitute acceptance by the Owner. Time period of this beneficial use cannot be included in the guarantee period.
2. Guarantee must also include restoration to its original condition of all adjacent work that is disturbed in fulfilling this guarantee.

3. All such repairs and/or replacements must be made without delay and at the convenience of the Owner.
4. Guarantees furnished by Trade Contractors and/or equipment manufacturers must be counter-signed by the related Trade Contractor for joint and/or individual responsibility for subject item.
5. Manufacturers' equipment guarantees or warranties extending beyond the guarantee period described in item #1 above must be transferred to the Owner along with the Trade Contractor's guarantees

1.5 HEATING, VENTILATING, AIR CONDITIONING AND REFRIGERATION WORK

A. General requirements HVAC as specified in Section 230010.

1. Unconditionally guarantee in writing all materials, equipment and workmanship for a period of **one (1) year** from date of acceptance by Owner. During the guarantee period, repair or replace, at the HVAC Trade Contractor's expense, any materials, equipment or workmanship in which defects may develop and provide free service for all equipment and systems involved in the contract during this guarantee period. Beneficial use of any system by any of the Trade Contractors during construction does not constitute acceptance by the Owner. Time period of this beneficial use cannot be included in the guarantee period.
2. Guarantee must also include restoration to its original condition of all adjacent work that is disturbed in fulfilling this guarantee.
3. All such repairs and/or replacements must be made without delay and at the convenience of the Owner.
4. Guarantees furnished by Trade Contractors and/or equipment manufacturers must be counter-signed by the related Trade Contractor for joint and/or individual responsibility for subject item.
5. Manufacturers' equipment guarantees or warranties extending beyond the guarantee period described in item #1 above must be transferred to the Owner along with the Trade Contractor's guarantees.

B. Packaged, Rooftop Air-Conditioning Units with Heat as specified in Section 237416.

1. Special Warranty: Manufacturer agrees to repair or replace components of RTUs that fail in materials or workmanship within specified warranty period.
 - a. Warranty Period for Compressors: Manufacturer's standard, but not less than **five (5) years** from date of Substantial Completion.
 - b. Warranty Period for Energy Recovery Wheel: Manufacturer's standard, but not less than **five (5) years** from date of Substantial Completion.

- C. Dedicated Outdoor-Air Units as specified in Section 237433.
 - 1. Warranty: Manufacturer agrees to replace components of units that fail in materials or workmanship within specified warranty period.
 - a. Warranty Period for Compressors: **Five (5) years** (non-prorated) from date of Substantial Completion. Should any part of the equipment prove to be defective in material or workmanship within the 5-year period, upon examination by the manufacturer, such part will be repaired or replaced by the manufacturer at no charge. The owner shall pay all labor costs incurred in connection with such repair or replacement.
 - b. Warranty Period for Stainless Steel Gas Heat Exchangers: **Twenty-five (25) years** (non-prorated) from date of Substantial Completion.

1.6 ELECTRICAL WORK

- A. General Requirements Electrical as specified in Section 260100.
 - 1. Unconditionally guarantee in writing all materials, equipment and workmanship for a period of **one (1) year** from date of acceptance by Owner. During the guarantee period, repair or replace, at the Electrical Trade Contractor's expense, any materials, equipment or workmanship in which defects may develop and provide free service for all equipment and systems involved in the contract during this guarantee period. Beneficial use of any system by any of the Trade Contractors during construction does not constitute acceptance by the Owner. Time period of this beneficial use cannot be included in the guarantee period.
 - 2. Guarantee must also include restoration to its original condition of all adjacent work that is disturbed in fulfilling this guarantee.
 - 3. All such repairs and/or replacements must be made without delay and at the convenience of the Owner.
 - 4. Guarantees furnished by Trade Contractors and/or equipment manufacturers must be counter-signed by the related Trade Contractor for joint and/or individual responsibility for subject item.
 - 5. Manufacturers' equipment guarantees or warranties extending beyond the guarantee period described in item #1 above must be transferred to the Owner along with the Trade Contractor's guarantees.
- B. Digital Programmed Lighting Control Devices as specified in Section 260923.
 - 1. **Five (5) year** 100% parts replacement.

C. LED Interior Lighting as specified in Section 265119.

1. LED light fixtures provided as a part of this project shall be provided with a **five (5) year** warranty.

END OF SECTION 01900

PART 2

GENERAL CONSTRUCTION WORK

SECTION 02070 - SELECTIVE DEMOLITION

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 DESCRIPTION OF WORK

- A. Extent of selective demolition work is indicated on the drawings.
- B. Type(s) of Selective Demolition Work: Demolition requires the selective removal and subsequent offsite disposal of the following:
 - 1. Portion(s) of building structure as indicated on drawings, as required to accommodate new construction.
 - 2. Removal and protection of existing fixtures and equipment items indicated as "salvage", and reinstallation and/or deliver to the Owner.
- C. Removal Work Specified Elsewhere:
 - 1. Mechanical and Electrical Work - Cutting non-structural concrete floors and masonry walls for underground piping, conduit, and for above grade piping, conduit, is included with the work of the respective mechanical and electrical trades.
- D. Related Work Specified Elsewhere:
 - 1. Remodeling construction work and patching is included within the respective sections of specifications, including removal of materials for re-use and incorporated into remodeling or new construction.

1.3 SUBMITTALS

- A. Proposed Demolition Activities: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's Representative for review prior to commencement of work. Provide starting and ending dates for each activity as appropriate.
 - 1. Include coordination for shut-off, capping, and continuation of utility services, as required, together with details for dust and noise control protection.
 - 2. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
 - 3. Sequence construction so as to minimize obstruction of exits and provide temporary alternate exits, as required by authorities having jurisdiction.
 - 4. Coordinate with Owner's continuing occupation of portions of existing building, and with Owner's reduced usage during summer months.

- B. Photographs: Photograph existing conditions of structure, surfaces, equipment or surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Owner's Representative prior to starting work.
- C. Project Record Documents:
 - 1. Indicate unanticipated structural, electrical, or mechanical conditions.

1.4 JOB CONDITIONS

- A. Occupancy: Owner will be continuously occupying areas of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities which will severely impact Owner's normal operations.
- B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.
 - 1. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
- C. Protections: Provide temporary barricades and other forms of protection, as required, to protect Owner's personnel and general public from injury due to selective demolition work.
 - 1. Provide protective measures , as required, to provide free and safe passage of Owner's personnel and general public to and from occupied portions of building.
 - 2. Protect existing finish work, from being damaged during the project, which is to remain in place and becomes exposed during demolition operations.
 - 3. Protect floors with suitable coverings so as to leave the flooring in same condition at end of job.
 - 4. Construct temporary insulated solid dustproof partitions, where required, to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors, if required.
 - 5. Remove protections at completion of work.
- D. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner, including but not limited to concealed interior and exterior utility lines not properly investigated by the contractor, prior to commencement of demolition work.
- E. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

1. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- F. Explosives: Use of explosives will not be permitted.
- G. Utility Services: Maintain existing interior and exterior utilities indicated to remain, keep in service, and protect against damage during demolition operations.
1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 INSPECTION

- A. Prior to commencement of selective demolition work, inspect areas in which work will be performed.
1. **Photograph existing conditions of structure, surfaces, equipment or surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Owner's Representative prior to starting work.**
 2. Commencement of work shall constitute acceptance of conditions. Any necessary remedial work required to correct any unsatisfactory conditions, found after the start of installation, will be provided at no cost to the Owner.
 3. Prior to the commencement of work review the demolition activities with the Owner's representative to identify additional salvage items requested by the Owner.

3.2 PREPARATION

- A. Cover and protect furniture, equipment and fixtures to remain from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.
- B. Erect and maintain dust-proof partitions and closures, as required, to prevent spread of dust or fumes to occupied portions of the building.
1. Provide weatherproof closures for exterior openings resulting from demolition work.
- C. Locate, identify, stub off and disconnect utility services that are not indicated to remain.
1. Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shut-down of service is necessary during change-over.

3.3 DEMOLITION

- A. Perform selective demolition work in a systematic manner. Use such methods , as required, to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
 - 1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
 - a. The Contractor shall use caution when cutting into existing masonry construction (eg.: concrete slabs, single wythe and cavity wall construction) as there may be undocumented utilities within the cavity or built into the cores of cmu wall construction or under the floor slab. The contractor shall perform all necessary investigation prior to demolition work to determine the presence of existing utilities within construction to be demolished, including but not limited to radar, thermal, impact echo, etc. The Contractor shall pay for restoring / repairing the existing construction if utilities are cut and proper selective demolition investigation work was not performed. Refer to Section 01050.
 - 2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors or framing.
 - 3. Provide services for effective air and water pollution controls, as required by authorities having jurisdiction.
 - 4. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.
- B. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative / Architect in written, accurate detail. Pending receipt of directive from Owner's Representative / Architect rearrange selective demolition schedule as necessary to continue overall job progress without delay.

3.4 SALVAGE MATERIALS

- A. Salvage Items: Where indicated on Drawings as "Salvage-Deliver to Owner", carefully remove indicated items, clean, store and turn over to Owner and obtain receipt.
 - 1. Unless otherwise indicated all materials, items, equipment, etc. resulting from demolition work shall be removed from the site at the Contractor's expense.
- B. Historic artifacts and other articles of historic significance remain the property of the Owner. Notify Owner's Representative if such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove debris, rubbish and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off-site.

- B. If hazardous materials are encountered during demolition operations, notify the Owner's Representative immediately, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.
- C. Burning of removed materials is not permitted on the project site.

3.6 CLEAN-UP AND REPAIR

- A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.
- B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 02070

SECTION 02514 - SITEWORK CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of concrete work is shown on the drawings.
 - 1. ADA accessible exterior slab, concrete walks, and platforms where shown.

1.2 QUALITY ASSURANCE

- A. Codes and Standards
 - 1. Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified.
 - ACI 301 "Specifications for Structural Concrete for Buildings."
 - ACI 311 "Recommended Practice for Concrete Inspection."
 - ACI 318 "Building Code Requirements for Reinforced Concrete."
 - ACI 347 "Recommended Practice for Concrete Formwork."
 - ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."
 - Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
- B. Concrete Testing Service: Employ, at the Contractor's expense, a testing laboratory acceptable to the Architect to perform material evaluation tests and to design concrete mixes.
- C. Comply with the requirements of Section 03300 and architectural, and mechanical drawings for concrete work, where applicable, as determined by the Architect / Engineer.

1.3 SUBMITTALS

- A. Submit all test reports to Architect with copy to Contractor.
- B. Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems and others as requested by the Architect.
- C. Submit samples of materials as specified and as otherwise may be requested by the Architect, including names, sources and descriptions as required.
- D. Provide test panels of exposed aggregate finish, repeating until Architect's approval is obtained.

1.4 JOB CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic, as required, for other construction activities, for facility operation and public use.

1. Utilize flagmen, barricades, warning signs and warning lights, as required.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Construct formwork for exposed concrete surfaces with plywood, metal, or other acceptable materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
- B. Provide commercial formulation form-coating compounds that will not bond with, stain or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces to be cured with water or curing compound. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

2.2 REINFORCING MATERIALS

- A. Welded Wire Fabric (WWF): ASTM A 185, welded steel wire fabric.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type 1, unless otherwise acceptable to the Architect.
- B. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for all exposed concrete.
 1. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances.
 2. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter as follows:
 - a. Maximum Aggregate Size: Not larger than one-fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs.
- C. Water: Clean, fresh, drinkable.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Water-Reducing Admixture: ASTM C 494, Type A.
- F. Set-Control Admixtures: ASTM C 494.
- G. Anti-Spalling Compound: 50 percent (by volume) boiled linseed oil and 50 percent (by volume) commercial grade kerosene or mineral spirits.
- H. Calcium Chloride will not be permitted in concrete, unless otherwise authorized in writing by the Architect.

2.4 RELATED MATERIALS

- A. Preformed Expansion Joint Fillers: Specified in Section 07900.
- B. Curing Compounds: Exterior slabs shall be cured with "Masterseal" manufactured by Master Builders; or approved equal. The compound shall conform to Federal Specification TT-C-800A, 30 percent solids, minimum.

2.5 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes in accordance with applicable provisions of ASTM C 94. Use an independent testing facility acceptable to the Architect for preparing and reporting proposed mix designs.
- B. Submit written reports to the Architect of proposed mix at least fifteen (15) days prior to the start of the work. Do not begin concrete production until mixes have been reviewed by the Architect.
- C. Design mix to provide normal weight concrete with the following properties.
 - 1. 3500 psi, 28-day compressive strength.
- D. Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant at no additional cost to the Owner and as accepted by the Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Architect before using in the work.
- E. Admixtures
 - 1. Use air-entraining admixture in exterior exposed concrete. Add air-entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having air content within the following limits.
 - a. Concrete exposed to freezing and thawing or subjected to hydraulic pressure:
 - 1) 5 percent for maximum 2 inch aggregate.
 - 2) 6 percent for maximum 3/4 inch aggregate.
 - b. Maximum water cement ratio: 0.40.
 - 2. Use admixtures for water-reducing and set-control in strict compliance with the manufacturer's directions.
- F. Slump Limits including Ready-Mix Concrete
 - 1. Ramps and Sloping Surfaces: Not more than 3 inches.
 - 2. All Other Concrete: Not less than 1 inch and not more than 4 inches.
- G. Ready-Mix Concrete: Comply with the requirements of ASTM C 94 and as herein specified.

PART 3 - EXECUTION

3.1 FORMS

- A. Construct forms complying with ACI 347, to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work.
- B. Form Ties: Factory-fabricated, adjustable length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete surfaces upon removal. Provide form ties which will not leave holes larger than 1 inch in diameter in concrete surface.
- C. Check completed formwork for grade and alignment to the following tolerances:
 - 1. Top of forms not more than 1/8 inch in 10 feet.
 - 2. Vertical face on longitudinal axis or radius, not more than 1/4 inch in 10 feet.
- D. Clean forms after each use, and coat with form release agent as often, as required, to ensure separation from concrete without damage.

3.2 REINFORCEMENT

- A. Reinforce walks with welded wire mesh, as indicated.
- B. Comply with the specified codes and standards, and Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- C. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one (1) full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.3 JOINTS AND SCREEDS

- A. Provide isolation joints between new and existing curbs and concrete paving, between new curbs or concrete paving and vertical surfaces, and where shown, but not exceeding 20 feet o.c. in all directions. Extend joint fillers full width and depth of joint, and not less than 1/2 inch or more than 1 inch below finished surface. Fill flush with sealer, as specified in Section 07900. Include shiplap siding detail, as shown.
- B. Weakened-Plane (Contraction) Joints: Provide weakened-plane joints, sectioning concrete into areas, as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:
 - 1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
 - 2. Provide tooled joints on 5 foot centers each way for paving and walks, or as shown on the drawings.

- C. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain the required elevations and contours in the finished slab surface. Provide and secure units sufficiently strong to support the types of screed strips by the use of strike-off templates or accepted compacting type screeds.

3.4 PREPARATION OF FORM SURFACE

- A. Coat the contact surfaces of forms with a form coating compound before reinforcement is placed.
- B. Do not allow excess form coating material to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with the manufacturer's instructions.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete the formwork installation and reinforcing steel.
- B. Comply with ACI 304, and as herein specified.
- C. Deposit concrete paving in a continuous operation, as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.
- D. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping, and use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI 309, to suit the type of concrete and project conditions.
- E. Bring slab surfaces to the correct level with a straightedge and strikeoff. Use bull floats or darbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.
- F. Maintain reinforcing in the proper position during concrete placement operations.
- G. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306.
- H. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305.

3.6 FINISH

- A. Smooth Form Finish: For formed concrete surfaces exposed to view. This is the as-cast concrete surface as obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with all fins or other projections completely removed and smoothed.
- B. Float Finish: Apply float finish to monolithic slab surfaces that are to receive other finishes as hereinafter specified. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both.

Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/8 inch in 10 feet when tested with a 10 foot straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

- C. After smooth form finishing or floating and when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
 - 1. Walks:
 - a. Broom finish by drawing a fine hair broom across concrete surfaces, perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect. Provide a smooth border at all joints and edges.
 - b. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff bristled broom, perpendicular to line of traffic.

3.7 CURING

- A. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 72 hours.
- B. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures.
- C. Cure formed concrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods as approved by Architect.
- D. Cure unformed surfaces, such as slabs, and other flat surfaces by application of the appropriate curing compound.

3.8 ANTI-SPALLING TREATMENT

- A. Apply compound to concrete surfaces no sooner than 28 days after placement. Apply to clean, dry concrete free of oil, dirt, and other foreign materials, in 2 sprayed applications. First application at rate of 40 square yards per gallon; second application, 60 square yards per gallon. Allow complete drying between applications.

3.9 REMOVAL OF FORMS

- A. Formwork may be removed after cumulatively curing at not less than 50 degrees F. for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

3.10 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. Sampling Fresh Concrete: ASTM C 172, except modified or slump to comply with ASTM C 94.
 - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

2. Slump: ASTM C 143; one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.
3. Compression Test Specimens: ASTM C 31; provide tests, as specified in Section 03300 - Concrete Work.

END OF SECTION 02514

SECTION 03300 - CONCRETE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. Extent of concrete slab infill work is shown on the drawings.
- B. Concrete paving and walks are specified in Section 02514.

1.3 SUBMITTALS

- A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds and others as required by Architect.
- B. Samples: Submit samples of materials as requested by Architect, including names, sources and descriptions.
- C. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test.
- D. Materials Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.
- E. Shop Drawings: Reinforcement: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing diagrams of bent bars, arrangement of concrete reinforcement.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

ASTM C94/C94M "Specification for Ready-Mixed Concrete"

ACI 117 "Tolerances for Concrete Construction and Materials"

ACI 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete"

ACI 301/301M "Structural Concrete for Buildings."

ACI 302.1R	"Guide for Concrete Floor and Slab Construction"
ACI 304R-00	"Guide for Measuring, Mixing, Transporting and Placing Concrete"
ACI 305R	"Hot Weather Concreting"
ACI 306R	"Cold Weather Concreting"
ACI 308.1	"Standard Specification for Curing Concrete"
ACI 311.1R	"ACI Manual of Concrete Inspection (SP-2)"
ACI 311.4R	"Guide for Concrete Inspection"
ACI 318	"Building Code Requirements for Reinforced Concrete", except as modified in accordance with International Building Code.
ACI 347R	"Guide to Formwork for Concrete"

Concrete Reinforcing Steel Institute, "Manual of Standard Practice."

- B. Concrete Testing Service: The Contractor shall engage a testing laboratory acceptable to Architect to perform material evaluation tests and to design concrete mixes.
- C. Materials and installed work may require testing and retesting at anytime during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.
- D. Installation of Vapor Barrier: Installation shall be in accordance with manufacturer's direction and in compliance with ASTM E 1745 "Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs".

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

- B. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.
- D. Welded Deformed Steel Wire Fabric: ASTM A 497.
- E. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II.
 - 1. Use one brand of cement throughout project, unless otherwise acceptable to Architect.
- B. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.
- C. Water: Drinkable.
- D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Air-Mix"; Euclid Chemical Co.
 - b. "Sika Aer"; Sika Corp.
 - c. "MB-VR or MB-AE"; Master Builders.
 - d. "Darex AEA" or "Daravair"; W.R. Grace.
 - e. Or approved equal
- E. Water-Reducing Admixture: ASTM C 494, Type A, and containing not more than 0.05 percent chloride ions.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "WRDA" Hycol"; W.R. Grace.
 - b. "Eucon WR-75" or "Eucon WR-89"; Euclid Chemical Co.
 - c. "Pozzolith 322N"; Master Builders.
 - d. "Plastocrete"; Sika Corp.
 - e. Or approved equal
- F. High-Range Water-Reducing Admixture (Super Plasticizer) ASTM C 494, Type F or Type G and containing not more than 0.05 percent chloride ions.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Daracem 100" or "WRDA-19"; W.R. Grace.
 - b. "Eucon 37"; Euclid Chemical Co.
 - c. "Rheobuild 1000"; Master Builders.
 - d. "Sika 686"; Sika Corporation.
 - e. Or approved equal

- G. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E, and containing not more than 0.024 percent chloride ions.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Accelguard 80"; Euclid Chemical Co.
 - b. "Daraset"; W.R. Grace
 - c. Or approved equal
- H. Water-Reducing, Retarding Admixture: ASTM C 494, Type D and containing not more than 0.05 percent chloride ions.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Pozzolith Retarder"; Master Builders.
 - b. "Eucon Retarder 75"; Euclid Chemical Co.
 - c. "Daratard 17"; W.R. Grace.
 - d. "Plastocrete 161R"; Sika Corporation.
 - e. Or approved equal
- I. Prohibited Admixtures: Calcium chloride thycyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.

2.4 RELATED MATERIALS

- A. Non-Shrink Grout: CRD-C 621, factory pre-mixed grout.
1. Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - a. Non-metallic:
 - 1) "Masterflow 713"; Master Builders
 - 2) "Euco-NS"; Euclid Chemical Co.
 - 3) "Five Star Grout"; U.S. Grout Corporation.
 - 4) Or approved equal
- B. Absorptive Cover: Burlap cloth made from jute or kenaf weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- C. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
1. Waterproof paper.
 2. Polyethylene film.
 3. Polyethylene-coated burlap.
- D. Clear curing and sealing compound (VOC Compliant): The compound shall have 30% solids content minimum, and will not yellow under ultra violet light after 500 hours of test in accordance with ASTM D 4887 and will have test data from an independent testing laboratory indicating a maximum moisture loss of 0.039 grams per sq. cm. when applied at a rate of 300 sq. ft. per gallon. Sodium silicate compounds are not permitted.
1. Product: "Super Diamond Clear Vox" by Euclid Chemical Co.; or approved equal.

- E. Vapor Barrier: Provide vapor barrier cover over prepared base material where indicated. Use only materials which are resistant to decay when tested in accordance with the following:
1. Thickness: 15 mils.
 2. Permeance: ASTM E 96; .01 perms before and after conditioning and in accordance with ASTM E 1745 Class A requirements and ATM E 154 for mandatory conditioning tests.
 3. Puncture Resistance: ASTM D 1709; 2200 grams.
 4. Chemical Resistance: ASTM E 154, unaffected.
 5. Life Expectancy: ASTM E 154, indefinite.
 6. Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - a. "Wrap 15-mil " Vapor Barrier; Stego Industries, LLC.
 - b. "VaporFLEX" by Layfield.
 - c. "Moistop Ultra 15-mil" by Fortifiber.
 - d. "Griffolyn G15" by Reef.
 - e. Or approved equal.
 7. Accessories: Seam tape; ASTM E 96 , 0.3 perms or lower.
 8. Vapor barrier sheets with seams overlapped not less than 12".
 9. **All penetrations must be sealed using a combination of the manufacturer's tape and/or mastic.**
 10. Installation shall be in accordance with manufacturer's direction and in compliance with ASTM E 1643-98 "Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs". Include manufacturer's recommended adhesive or pressure-sensitive tape.
- F. Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.

2.5 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.
- B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.
- C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

1. 3500 psi 28-day compressive strength; W/C ratio, 0.47 maximum.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be admitted to and accepted by Architect before using in work.
- E. Admixtures:
1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.
 2. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.
 3. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content within following limits.
 - a. 5% for maximum 2" aggregate
 - b. 6% for maximum 3/4" aggregate
 - c. 7% for maximum 1/2" aggregate
- F. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
1. Ramps, slabs and sloping surfaces: Not more than 3".
 2. Reinforced foundation systems: Not less than 1" and not more than 3".
 3. Other concrete: Not less than 1" nor more than 4"

2.6 CONCRETE MIXING

- A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.
- B. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

PART 3 - EXECUTION

3.1 FORMS

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structure are of correct size, shape, alignment, elevations and position.
- B. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keywarp, recesses, moldings, rustications, reglets, chamfers, blocking,

screeds, bulkheads, anchorages and inserts, and other features, required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

3.2 PLACING REINFORCEMENT

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
 - 1. Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.
- B. Clean reinforcement of loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.3 JOINTS

- A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate at a maximum spacing of 90 feet, so as not to impair strength and appearance of the structure, as acceptable to Architect.
- B. Control Joints: Locate and install control joints as indicated or at a maximum spacing of 30 feet. Locate at a spacing which does not impair appearance of the structure as acceptable to Architect.
- C. Joint filler and sealant materials are specified in Section 07900.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms, or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

- C. Installation of Vapor Barrier: Install materials in accordance with manufacturer's direction and in compliance with ASTM 1643-98 "Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs".
 - 1. Seal all slab penetrations with manufacturer's approved or recommended tapes, sealants, adhesives, and other materials to achieve indicated testing requirements.
 - 2. Protect vapor barrier materials during construction operation, repair or replace damaged material with new materials.

3.5 CONCRETE PLACEMENT

- A. Pre-placement inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.
 - 1. Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.
- B. General: Comply with ACI 304R-00 "Guide for Measuring, Mixing, Transporting and Placing Concrete", and as herein specified.
- C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
- D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
- E. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
- F. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
- G. Maintain reinforcing in proper position during concrete placement operations.
- H. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which would be caused by frost, freezing actions or low temperatures, in compliance with ACI 306R.
- I. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
- J. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305R.

3.6 MONOLITHIC SLAB FINISHES

- A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with flooring and as otherwise indicated.
- B. After screeding, consolidating and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to tolerances as follows:
 - 1. Ff 12 - Fl 9 For noncritical areas: mechanical rooms and surfaces to have thick-set tile.
 - 2. Ff 15 - Fl 12 For carpeted areas
 - 3. Ff 21 - Fl 15 For thin-set flooring
 - 4. Ff 27 - Fl 21 For warehouse, gymnasiums.
 - 5. Ff 30 - Fl 30 For TV studios

Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

- C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, tile or other thin film finish coating system.
- D. After floating, begin first trowel finish operation using a power driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances as follows:
 - 1. Ff 20 - Fl 15 For noncritical areas: mechanical rooms and surfaces to have thick-set tile.
 - 2. Ff 25 - Fl 20 For carpeted areas
 - 3. Ff 35 - Fl 25 For thin-set flooring
 - 4. Ff 45 - Fl 35 For warehouse, gymnasiums.
 - 5. Ff 50 - Fl 50 For TV studios

Grind smooth surface defects which would telegraph through supplied floor covering system.

- E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps and elsewhere, as indicated.

3.7 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 308 (latest edition)

procedures. Avoid rapid drying at end of final curing period.

- D. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing and by combinations thereof, as herein specified.
- E. Provide moisture curing by following methods.
 - 1. Keep concrete surface continuously wet by covering with water.
 - 2. Continuous water-fog spray.
 - 3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 12" lap over adjacent absorptive covers.
- F. Provide moisture-cover curing as follows:
 - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, place in widest practicable width with sides and ends lapped at least 12" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- G. **Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, flooring (such as ceramic or quarry tile, glue-down carpet, etc.), painting and other coatings and finish materials, unless otherwise acceptable to Architect.**
- H. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.
- I. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture retaining cover, unless otherwise directed.

3.8 CONCRETE SURFACE REPAIRS

- A. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.
- B. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets and other objectionable conditions.
- C. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
- D. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

- E. Underlayment Application: Leveling of floors for subsequent finishes may be achieved by use of specified underlayment material.

3.9 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The Contractor will employ and pay for a testing laboratory to perform the following tests, inspect formwork and reinforcement placement and to submit test reports. Testing laboratory must be pre-approved by the Architect.
- B. Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.
- C. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - 1. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - 2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
- D. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
- E. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
- F. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
- G. Test results will be reported in writing to Architect, Structural Engineer and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
- H. Nondestructive Testing: Impact hammer, sonoscope or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- I. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

END OF SECTION 03300

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SECTION 03450 - SELF-DRYING FINISHING UNDERLAYMENT

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. Section Includes:
 - 1. Extent of Self Drying Cement - Based Finishing Underlayment for flooring work as indicated on drawings.
- B. Related Section:
 - 1. Section 09650 - Resilient Flooring

1.3 DEFINITIONS

- A. Self-Drying Finishing Underlayment for flooring includes systems which consist of materials specially formulated, portland cement self-smoothing, rapid hardening compound to level and repair existing interior concrete slabs.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, installation instructions, and general recommendations for each major product required. Include data substantiating that products to be furnished comply with requirements of the contract documents.
- B. Test Reports: Submit results of testing specified.
 - 1. Certificates: Submit manufacturer's test data certifying compliance with specified performance requirements.
 - 2. Test reports: Submit test data for moisture content and hydrostatic pressure of existing concrete slab.
- C. Certificates: Submit manufacturer's certification that products comply with requirements of the contract documents.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain required products from a single manufacturer.
- B. Manufacturer Experience: Provide products of this section by companies which have successfully specialized in production of this type of work for a recommended 5 years.

- C. Installer's Qualifications: All work of this section shall be performed by an experienced applicators, licensed by the manufacturer of the system and successfully completed this type of work for a recommended 2 years.
- D. Codes and Standards: Comply with requirements of the contract documents or of governing codes and authorities having jurisdiction.
- E. Mock-up: Prior to installation of work of this section, erect sample at location directed by or acceptable to the Architect, using specified materials and workmanship to be expected in the completed work. Once mock-up has been approved by the Architect, retain until the work has been completed and accepted.
 - 1. Configuration: Approximately 4 feet by 4 feet.
 - 2. Mock-up may not be incorporated into the final work; demolish and remove from site when directed by the Architect.
- F. Pre-installation Conference: Prior to installation of work of this section, conduct a meeting at the project site to discuss quality assurance requirements. In addition to the contractor and the installer, arrange for attendance of the following:
 - 1. Other installers affected by the work of this section.
 - 2. The Owner's representative.
 - 3. The Architect.
 - 4. Manufacturer's representative.
 - 5. Supplier.
- G. Allowable Tolerances:
 - 1. Variation from Level: Do not exceed 1/4 inch in any bay or 10 feet in distance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials dry at all times. Protect against exposure to weather and against contact with damp or wet surfaces.
- B. Store materials on one site to maintain proper separation and grading integrity. Cover materials to prevent excessive accumulation of moisture.
- C. Protect materials from excessive moisture in shipment, storage, and handling. Deliver materials in manufacturer's unopened packages, and store in dry place with adequate air circulation.
- D. Storage: Stack products of this section carefully to provide air circulation within stacks.

1.7 PROJECT CONDITIONS

- A. Environmental Requirements: Do not proceed with installation when air temperatures are below 40°F, or above 95°F, unless protective measures acceptable to the manufacturer are taken.

- B. Do not proceed with installation until temperature and relative humidity have been stabilized and will be maintained within values established by the manufacturer for optimum quality control.
- C. Provide adequate ventilation to prevent accumulation of hazardous fumes during application of components in enclosed spaces, and maintain ventilation until materials have thoroughly cured.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate work of this section with other trades and installation of special construction and equipment.

1.9 WARRANTY

- A. Special Project Warranty: Submit a written warranty signed by the manufacturer, the contractor, and the installer, guaranteeing to correct failures in materials and workmanship which occur within the warranty period, including those attributable to abnormal aging, without reducing or otherwise limiting any other rights to correction which the Owner may have under the contract documents.
 - 1. The warranty shall include responsibility for removing and replacing other work as necessary to accomplish repairs or replacement of materials covered by the warranty.
 - a. Warranty period: Minimum **two (2) years** after date of substantial completion.

PART 2 - PRODUCTS

2.1 MIXES

- A. Basis of Design: "Ardex Feather Finish" Self-Drying, Cement -Based Finishing Underlayment, as manufactured by ARDEX Engineered Cements; or approved equal.
- B. Subject to compliance with requirements of the Contract Documents, manufacturers offering products which may be incorporated in work include the following:
 - 1. Mapei,
 - 2. CMP Specialty Products,
 - 3. Or approved equal.
- C. Follow the manufacturer's printed instructions, procedures and recommended equipment for mixing the components.
 - 1. Mixing Ratio: 2½ quarts of water per 10 lbs. bag at 70°F.
 - a. For smaller batches, use 2 parts powder to 1 part water by volume.
- D. Compressive Strength: ASTM C 109, 4200 psi, minimum.
- E. VOC: 0

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect substrates and conditions under which the work of this section will be performed, and verify that installation properly may commence. Do not proceed with the work until unsatisfactory conditions have been resolved fully.
 - 1. Commencement of work shall constitute acceptance of conditions. Any necessary remedial work required to correct any unsatisfactory conditions, found after the start of installation, will be provided at no cost to the Owner.
 - 2. If asbestos abatement of flooring products was performed (by others), review product information on the product(s) used (by others) to remove the adhesive(s) to ensure compatibility.
- B. Testing: Perform required testing of existing concrete slab, for hydrostatic pressure and moisture content. Follow manufacturer's recommended procedures for testing slab. Do not proceed with the work until unsatisfactory conditions have been resolved fully.

3.2 PREPARATION

- A. Clean substrate, removing projections, all loose material and substances detrimental to the work; comply with recommendations of manufacturer of products to be installed for proper preparation procedures.
- B. Prepare substrate in accordance with recommendations of manufacturer for optimum installed performance.
- C. Mask off or otherwise protect adjacent surfaces not scheduled to receive products of this section.
- D. Coordinate installation with other trades, report conditions in writing to the Owner/Architect. Do not proceed with application work until any unsatisfactory conditions have been corrected.

3.3 APPLICATION

- A. General: Comply with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
 - 1. Apply materials to the substrate with flat side of a steel trowel to obtain a solid mechanical bond. Apply sufficient pressure to fill all defects and to feather the product into the subfloor surface and to suit existing substrate conditions.

3.4 CLEANING

- A. Upon completion, clean all surfaces which have become soiled or coated as a result of work of this section, using proper methods which will not scratch or otherwise damage finished surfaces.

- B. For cleaning, use only products and techniques acceptable to manufacturer of products being cleaned.

3.5 PROTECTION

- A. General: Institute protective procedures and install protective materials as required to ensure that work of this section will be without damage or deterioration.

END OF SECTION 03450

SECTION 04200 - UNIT MASONRY

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 DESCRIPTION OF WORK

- A. Extent of each type of masonry work is indicated on drawings and schedule.
- B. Type of masonry work required includes:
 - 1. Concrete unit masonry.
 - 2. Brick masonry.
 - 3. Masonry bond beams.
 - 4. Mortar and grout.
 - 5. Reinforcement, anchorage, and accessories.
 - 6. Concealed Flashing
 - 7. Installation of miscellaneous loose steel lintels, plates and other steel fabrications.
- C. Related Work:
 - 1. Section 05400 - Miscellaneous Structural Steel.
 - 2. Section 05500 - Metal Fabrications.
 - 3. Section 07200 - Building Insulation.
 - 4. Section 07270 - Fluid Applied Air/Vapor Barriers.
 - 5. Section 07600 - Flashing, Sheet Metal and Roof Accessories.
 - 6. Section 07900 - Joint Sealer Assemblies.
 - 7. Section 08110 - Hollow Metalwork.
 - 8. Section 08410 - Aluminum/FRP Doors.
 - 9. Section 08415 - Aluminum Storefront.
 - 10. Section 09900 - Painting of exposed to view CMU surfaces.

1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Where indicated, provide materials and construction which are identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E119 by a recognized testing and inspecting organization or by another means, as acceptable to authority having jurisdiction.
- B. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- C. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

- D. Field Constructed Mock-Ups: Prior to installation of masonry work, erect sample wall panels to further verify selections made for color and textural characteristics, under sample submittals of masonry units and mortar, and to represent completed masonry work for qualities of appearance, materials and construction.
- E. **Build mock-up(s) in size of approximately 18" long by 18" high, brick panel to confirm selection of brick and mortar match.**
- F. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- G. Masonry Pre-Installation Meeting: Prior to installation of any above-grade masonry work, there shall be a Masonry Pre-Installation Meeting between the General Construction Work Contractor, all masonry Subcontractors (if any), and the Architect. At this meeting, all masonry construction products and procedures shall be reviewed.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements.
- B. Samples for Verification Purposes: Submit the following samples:
 - 1. For selection of brick, submit products of all local manufacturers that the manufacturers consider to be their closest match. Resubmit until match meets approval of Architect.
 - 2. Colored masonry mortar samples for each color required showing the full range of color which can be expected in the finished work. Label samples to indicate type and amount of colorant used.
- C. Shop Drawings: Submit shop drawings for the following:
 - 1. All locations of Vertical Control Joints for interior concrete masonry unit walls including control joints shown.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.
- C. Limit moisture absorption of concrete masonry units during delivery and until time of installation to the maximum percentage specified for Type I units for the average annual relative humidity as reported by the U.S. Weather Bureau Station nearest project site.
- D. Store cementitious materials off the ground, under cover and in dry location.

- E. Store aggregates where grading and other required characteristics can be maintained.
- F. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.
- G. Coordinate delivery and application of air/vapor barrier with the delivery and application of the cavity insulation to ensure the installation of these products are completed within the same construction phase.
- H. Deliver air/vapor barrier membranes, adhesives and primers to the jobsite in undamaged and original packaging indicating the name of the manufacturer and product. Store roll materials on end in original packaging. Protect rolls from direct sunlight until ready for use. Store air/vapor barrier membranes, adhesives and primers at temperature of 40°F. and rising. Keep solvent away from open flame and excessive heat.

1.6 REFERENCE STANDARDS

- A. Comply with the current applicable provisions of all codes, regulations, industry standards and specifications referenced in this section, unless otherwise modified by the requirements of the Contract Documents, including but not limited to the following:
 1. ACI 531 Building Code Requirements for Masonry Structures.
 2. ACI 531 Commentary on Building Code Requirements for Masonry Structures.
 3. ACI 530.1 Specification for Masonry Construction.
 4. ASTM C-90 Load Bearing Masonry Units.
 5. ASTM C-129 Non-Load Bearing Masonry Units.
 6. ASTM C 140 Testing Concrete Masonry Units.
 7. ASTM C 216 Testing Facing Brick (Solid Masonry Units Made from Clay or Shale).
 8. ASTM C 270 Standard Specification for Mortar for Unit Masonry
 9. ASTM C 780 Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
 10. ASTM C 1586 Standard Guide for Quality Assurance of Mortars.
 11. ASTM E - 119 Fire Tests with Building Construction and Materials.
 12. BIA Technical Notes on Brick Construction.
 13. BIA Technical Notes on Brick Construction: Technical Note #46 "Maintenance of Brick Masonry.
 14. NCMA TEK Bulletins.
 15. ASTM D7957/D7957M - Standard Specification for Solid Round Glass Fiber Reinforced Polymer Bars for Concrete Reinforcement.
 16. ASTM E2178 Standard Test Method for Air Permeance of Building Materials
 17. ASTM E2357 Standard Test Method for Determining the Air Leakage of Air Barrier Assemblies.
 18. ASTM E96 Water Vapor Transmission of Materials.
 19. NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.7 PROJECT CONDITIONS

- A. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls

- B. Do not apply concentrated loads for at least 3 days after building masonry walls.
- C. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.
- D. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
- E. Protect sills, ledges and projections from droppings of mortar.
- F. Cold Weather Protection:
 - 1. Do not lay masonry units which are wet or frozen.
 - 2. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
 - 3. Remove masonry damaged by freezing conditions.
 - 4. For clay masonry units with initial rates of absorption (suction) which require them to be wetted before laying, comply with the following requirements:
 - a. For units with surface temperatures above 32°F (0°C), wet with water heated to above 70°F.
 - b. For units with surface temperature below 32°F (0°C), wet with water heated to above 130°F.
- G. Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout.
- H. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10°F.
 - 1. 40 degrees F to 32 degrees F:
 - a. Mortar: Heat mixing water to produce mortar temperature between 40°F and 120°F. Setting time will be limited to 60 minutes from initial mixing.
 - b. Grout: Follow normal masonry procedures.
 - 2. 32 degrees F to 25 degrees F:
 - a. Mortar: Heat mixing water and sand to produce mortar temperatures between 40°F and 120°F; maintain temperature of mortar on boards above freezing.
 - b. Grout: Heat grout materials to 90°F to produce in-place grout temperature of 70°F at end of work day.
 - 3. 25 degrees F to 20 degrees F:
 - a. Mortar: Heat mixing water and sand to produce mortar temperatures between 40°F and 120°F; maintain temperature of mortar on boards above freezing.
 - b. Grout: Heat grout materials to 90°F to produce in-place grout temperature of 70°F at end of work day.
 - c. Heat both sides of walls under construction using salamanders or other heat sources.
 - d. Use windbreaks or enclosures when wind is in excess of 15 mph.

4. 20 degrees F and below:
 - a. Mortar: Heat mixing water and sand to produce mortar temperatures between 40°F and 120°F.
 - b. Grout: Heat grout materials to 90°F to produce in-place grout temperature of 70°F at end of work day.
 - c. Masonry Units: Heat masonry units so that they are above 20°F at time of laying.
 - d. Provide enclosure and auxiliary heat to maintain an air temperature of at least 40°F for 24 hours after laying units.
 - e. Do not heat water for mortar and grout to above 160°F.
- I. Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.
 1. 40 degrees F to 32 degrees F:
 - a. Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.
 2. 32 degrees F to 25 degrees F:
 - a. Completely cover masonry with weather-resistive membrane for at least 24 hours.
 3. 25 degrees F to 20 degrees F:
 - a. Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.
 4. 20 degrees F and below:
 - a. Except as otherwise indicated, maintain masonry temperature above 32°F (0°C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40°F (4°C) for 48 hours.

1.8 WARRANTY

- A. The Contractor shall warrant the exterior walls to be free from leakage due to any natural cause for a period of **five (5) years** from date of final acceptance of the building and he shall, within such period at his own expense, upon written notification from the Owner, pursue such remedial measures as may be necessary to correct any condition of leakage and damage incidental thereto that may develop. The Contractor in signing this Contract accepts the above conditions. In so doing, he also agrees either that the materials and methods specified herein are such as to insure the results required or that he will, at no additional expense, furnish such additional or alternative items of labor and materials (or both) as may be necessary to accomplish the stated intent of the Contract.
- B. Flexible Copper Flashing:
 1. Special warranty:
 - a. Manufacturer shall warrant flexible flashing material for **life of the wall**.
 - b. Begin warranty from the Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Manufacturer: Obtain masonry units from one manufacturer, of uniform texture and color for each kind required, for each continuous area and visually related areas.
 - 1. Brick: Subject to compliance with requirements, manufacturers of brick units which may be incorporated in the work include, but are not limited to, the following:
 - a. Church Brick Company.
 - b. Consolidated Brick.
 - c. Diener Brick Company.
 - d. Tri-State Brick & Building Materials, Inc.
 - e. The Belden Brick Company.
 - f. Or approved equal.
 - 2. Concrete Masonry Units: Subject to compliance with requirements, manufacturers of concrete masonry units which may be incorporated in the work include, but are not limited to, the following:
 - a. Anchor Concrete Products Inc.
 - b. Clayton Block Co., Inc.
 - c. EP Henry Corporation.
 - d. York Building Products, a Stewart Company.
 - e. Or approved equal.
 - 3. Masonry Anchors, Joint Reinforcing, Accessories, etc.: Subject to compliance with requirements, manufacturers of masonry anchors, joint reinforcing, accessories which may be incorporated in the work include, but are not limited to, the following:
 - a. Heckman Building Products, Inc.
 - b. Hohmann & Barnard, Inc.
 - c. Or approved equal.

2.2 BRICK MADE FROM CLAY OR SHALE

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of brick required.
- B. Size: Provide bricks manufactured to the following actual dimensions:
 - 1. Match existing.
- C. Provide special molded shapes where indicated and for application requiring brick of form, size and finish on exposed surfaces which cannot be produced from standard brick sizes by sawing.
- D. For sills, caps and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view, provide uncured or unfroged units with all exposed surfaces finished.

- E. Facing Brick: ASTM C 216, and as follows:
 - 1. Grade SW.
 - 2. Type: FBS.
 - 3. Compressive Strength: 8,000 psi, average, per ASTM C67.
 - 4. Application: Use where brick is exposed, unless otherwise indicated.
 - 5. Texture and Color: Match existing.
 - 6. Wherever shown to "match existing", provide face brick of matching color, texture and size as existing adjacent brickwork.
- F. Efflorescence: Provide brick tested and rated in compliance with ASTM C67.

2.3 CONCRETE MASONRY UNITS

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.
- B. Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
 - 1. Provide bullnose units for outside corners unless otherwise indicated.
- C. Concrete Block: Provide units complying with characteristics indicated below for face size, exposed face and under each form of block included, for weight classification.
- D. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thicknesses indicated.
- E. Hollow Loadbearing Block: ASTM C90 and as follows:
 - 1. Weight Classification: Lightweight.

2.4 MASONRY LINTELS

- A. General: Provide one of the following:
 - 1. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMU's matching adjacent CMU's in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 MORTAR AND GROUT MATERIALS

- A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
- B. Limit cementitious materials in mortar to portland cement-lime.
- C. Portland Cement: ASTM C150, Type 1, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.
- D. For colored aggregate mortars use masonry cement, ASTM C91, of natural color or white as required to produce mortar colors required.
- E. Hydrated Lime: ASTM C207, Type S.
- F. Aggregate for Mortar: ASTM C144, except for joints less than 1/4 inch use aggregate graded with 100% passing the No. 16 sieve.
 1. White Mortar Aggregates: Natural white sand or ground white stone.
 2. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.
- G. Mortar: ASTM C387, Type N. Provide mortar for face brick and accessories to match original mortar in color, texture, strength and hardness (density and porosity). Determine existing mortar mix constituents and ratios by analysis. Review laboratory evaluations with Architect before proceeding with the work. Match color of existing mortar by use of aggregates matching original aggregate color where possible. Use inorganic coloring pigments if satisfactory color match cannot be attained with natural materials.
 1. Use Type M mortar for masonry below grade and in contact with earth, and where indicated.
 2. Use Type S mortar for exterior, above-grade loadbearing and non-loadbearing CMU walls; for interior loadbearing CMU walls; and for other applications where another type is not indicated.
- H. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification, for types of mortar required, unless otherwise indicated.
- I. Grout for Unit Masonry: Comply with ASTM C476.
 1. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143.
- J. The proper use of ASTM C270 and Test Method ASTM C780 for evaluating masonry mortars produced in the laboratory and the construction site is in accordance with ASTM C1586.
- K. Aggregate for Grout: ASTM C404.
- L. Water: Clean and potable.

- M. Colored Aggregate Mortar: Produce mortar of color required by use of colored aggregates in combination with selected cementitious materials.
 - 1. Colors as selected by the Architect from manufacturer's available full range of colors.

2.6 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

- A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:
 - 1. Hot-Dip Galvanized Steel Wire: ASTM A82 for uncoated wire and with ASTM A153, Class B-2 (1.5 oz. per sq. ft. of wire surface) for zinc coating applied after prefabrication into units.
- B. Joint Reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:
 - 1. Width: Fabricate joint reinforcement in units with widths of approximately 2 inch less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8 inch on joint faces exposed to exterior and 1/2 inch elsewhere.
 - a. Wire Size for Side Rods: 9 gauge.
 - b. Wire Size for Cross Rods: 9 gauge.
 - 2. Ladder design rods spaced not more than 16 inch o.c.
 - 3. Number of Side Rods: One side rod for each face shell of concrete masonry back-up and one rod for brick wythe.
 - 4. Configuration:
 - a. Applications of Single Wythe Wall width: Ladder type design rods at not more than 16 inches on center.
 - 1) Basis of Design: Provide Hohmann & Barnard, Inc., No.# 220, Ladder-Mesh; or approved equal.
 - b. Applications of more than one unit width, exterior cavity walls (Masonry back-up), Seismic design:
 - 1) Basis of Design: Provide Hohmann & Barnard, Inc., No.# 270-ML (Mighty-LOK® - Ladder style); or approved equal.
- C. Reinforcing Bars: Deformed steel, ASTM A615, Grade 60 for bars No. 3 to No. 18.

2.7 CONCEALED FLASHING MATERIALS

- A. **Type 2:** Thru-Wall Copper Fabric Flashing (Asphalt-Free): (At the head of window, door and unit ventilator masonry openings, existing columns in masonry cavity wall or where indicated). Provide end dams where shown, or as required.
 - 1. Basis of Design: "Multi-Flash 500 Series", as manufactured by York Manufacturing, Inc.; or approved equal.
 - a. Subject to compliance with requirements of the Contract Documents,

manufacturers offering products which may be incorporated in work include the following:

- 1) "Copper Sealtite 2000®", as manufactured by Advanced Building Products Inc.,
 - 2) "Gorilla Flash GF-500, as manufactured by STS Coatings, Inc.,
 - 3) "Copper Seal", as manufactured by Wire-Bond, Inc.,
 - 4) Or approved equal.
2. Type: Copper core with polymer fabric laminated to copper face on both sides with non-asphalt adhesive.
 - a. Copper Type: CDA Alloy 110, 060 temper in accordance with ASTM B370.
 - b. Copper Weight: 5 oz. per square foot.
 3. Fabric: Polymer fabric; laminated to each face of copper core with core weight manufacturer identified on product with color coded laminate.
 4. Adhesive: Non-asphalt for laminating adhesive.
 5. Size: Manufacturer's standard roll width and length.
 6. Mastic/Sealant: Manufacturer's standard for specified flashing.
 - a. Type: One part 100% solids, solvent-free formulated silyl-terminated polyester (STPE), ASTM C920-11, Type S, Grade NS, Class 50.
 7. Provide "FTSA" stainless steel drip plate as manufactured by Hohmann & Barnard, Inc.; Polyguard Products Inc.; Masonpro Inc.; Mortar Net USA Ltd.; or approved equal, adhered to the Perm-A-Barrier Wall Flashing, between the steel lintel and the exterior finish masonry.
 - a. Provide factory fabricated stainless-steel drip plate from ASTM A240, Type 304, 26 gauge continuous, Type FTS with 1/8" thick compressible filler adhered to bottom of drip plate.
 - 1) Extend horizontal leg flashing not less than 3-inches into masonry wall and bend down from outer edge of wall or steel lintel for 1/2" at 30 degree from horizontal, and hem.
 - 2) Fabricate in 8 to 12 feet lengths and provide stainless-steel splice plates at joints between lengths.
 - 3) Provide factory fabricated outside and inside corner pieces.
 8. Termination Bar: Where indicated, or required, provide manufacturer's standard 1" wide, minimum by 1/8" thick, minimum by continuous length pre-punched stainless-steel bar or composite material bar complete with stainless-steel fasteners.
 - a. Subject to compliance with requirements of the Contract Documents, manufacturers offering products which may be incorporated in work include the following:
 - 1) Heckmann Building Products, Inc.,
 - 2) Or approved equal.
 9. Provide specially fabricated units and interior corner conditions. Lap flashing a minimum of 6-inches and seal laps with mastic, or as recommended by manufacturer.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Non-Metallic Expansion Joint Strips: Premolded, flexible cellular neoprene rubber filler strips complying with ASTM D1056, Grade 2A1, capable of compression up to 35%, of width and thickness indicated.
- B. Weepholes: Provide the following for weepholes:
 - 1. Plastic, Rectangular with screen: Item # 342 W/S; Hohmann & Barnard, Inc.; or approved equal
 - a. Medium density polyethylene 3/8 inch x 1-1/2 inch x 3-1/2 inch clear color plastic with stainless steel screens and cotton wicks.
- C. Mortar Net: Basis of Design: Provide Mortar Net as manufactured by Mortar Net USA, Ltd.; or approved equal.
 - 1. Size: 10 inches high x 1½ inches thick x 5 feet long.
 - 2. Provide mortar net inside masonry cavity walls to keep weepholes open. Install in accordance with manufacturer's printed instructions.

2.9 CAVITY INSULATION: Refer to Section 07200.

2.10 AIR/ VAPOR BARRIER: Refer to Section 07270.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Wetting Clay Brick: Wet brick made from clay or shale which have ASTM C67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute. Use wetting methods which ensure each clay masonry unit being nearly saturated but surface dry when laid.
- B. Do not wet concrete masonry units.
- C. Cleaning Reinforcing: Before placing, remove loose rust, ice and other coatings from reinforcing.
- D. Thickness: Build cavity and composite walls, floors and other masonry construction to the full thickness shown. Build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness indicated.
- E. Build chases and recesses as shown or required for the work of other trades. Provide not less than 8 inch of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.
- F. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

- G. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible. No discoloration of units caused by cutting will be acceptable.
- H. Pattern Bond:
 - 1. Brick: Running bond, unless otherwise shown.
 - 2. Concrete masonry units: Running bond, unless otherwise shown.
 - 3. Lay concealed masonry with all units in a wythe bonded by lapping not less than 2 inches.
- I. All concrete masonry units and courses below grade shall be filled solid with grout.

3.2 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4 inch in 10 feet, or 3/8 inch in a story height not to exceed 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4 inch in any story or 20 feet maximum, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints do not exceed plus or minus 1/4 inch in 10 feet, 1/2 inch maximum.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4 inch in any bay or 20 feet maximum, nor 1/2 inch in 40 feet or more. For top surface of bearing walls do not exceed 1/8 inch between adjacent floor elements in 10 feet or 1/16 inch within width of a single unit.
- C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2 inch in any bay or 20 feet maximum, nor 3/4 inch in 40 feet or more.
- D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch nor plus 1/2 inch.
- E. Variation in Mortar Joint Thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not exceed head joint thickness indicated by more than plus or minus 1/8 inch.

3.3 LAYING MASONRY WALLS

- A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.
- B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.

- C. Stopping and Resuming Work: Rack back ½-unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.
- D. Built-in Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.
 - 1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
 - 2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
 - 3. Fill cores in hollow concrete masonry units with grout 3 courses (24 inches) under bearing plates, beams, lintels, posts and similar items, unless otherwise indicated.
- E. Extend all interior walls full height to underside of structure of deck, unless otherwise indicated. Include compressible insulation at top to completely close space between wall and structure above.
- F. Support and protect masonry, indicated to remain, which surrounds removal area.
 - 1. Refer to BIA, Technical Note #46: "Maintenance of Brick Masonry", www.gobrick.com/Portals/25/docs/Technical%20Notes/TN46.pdf, for two recommended methods to properly support existing brickwork when installing new mechanically keyed through wall flashing, and as indicated below:
 - a. Method 1: Remove alternate sections of masonry in 2'-0" to 5'-0" (610 mm to 1.52m) lengths.
 - b. Method 2: Temporary braces can be installed to permit the removal of longer sections of masonry.

Note: The replaced masonry should be properly cured (5 to 7 days) before the intermediate masonry sections or supports are removed.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay solid brick size masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.
- B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.
- C. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8 inch joints.
- D. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.

- E. Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated.
- F. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

3.5 CAVITY WALLS

- A. Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity flush.
- B. Tie exterior wythe to back-up with continuous horizontal joint reinforcing, installed in mortar joints at not more than 16" o.c. vertically.
- C. Provide weep holes in exterior wythe of cavity wall located immediately above ledges and flashing, spaced 2'-0" o.c., unless otherwise indicated.
- D. Provide concealed flashing in cavity walls at all required locations and as indicated herein after.
- E. On units of plastic insulation, install small pads of mastic spaced approximately 1'-0" o.c. both ways on inside face, as recommended by manufacturer. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

3.6 AIR/ VAPOR BARRIER: Refer to Section 07270.

3.7 HORIZONTAL JOINT REINFORCEMENT

- A. Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
 - 1. Space continuous horizontal reinforcement as follows:
 - a. For multi-wythe walls (solid or cavity) where continuous horizontal reinforcement acts as structural bond or tie between wythes, space reinforcement as required by code but not more than 16 inches o.c. vertically.
 - b. For single-wythe walls, space reinforcement at 16" o.c. vertically, unless otherwise indicated.
 - 2. Cut reinforcement units at walls intersecting and/or abutting firewalls. Provide control joints with fire-rated sealant as indicated in Section 07900.

- D. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Provide vertical and horizontal expansion, control and isolation joints in masonry maximum 30 feet on center. Build-in related items as the masonry work progresses.
 - 1. Coordinate location of all control and expansion joints in the field with Architect prior to commencement of work.
- B. Build in joint fillers where shown: See Section 07900, Joint Sealers. Joint width for sealants: 3/8 inch unless otherwise indicated. Include straight joints at vertical recessed brick detail.

3.9 LINTELS

- A. Install loose lintels of steel and other materials where shown.
- B. Provide masonry lintels where shown and wherever openings of more than 1'-0" are shown without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Precast lintels shall be scored to simulate adjacent blockwork. Cure precast lintels before handling and installation. Temporarily support formed-in-place lintels.
- C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.10 FLASHING OF MASONRY WORK

- A. **NOTE: When Contractor must remove a portion of the existing masonry wall veneer in order to install through wall flashing or other work, the Contractor MUST follow the Brick Industry Association (Technical Note #46) and the Concrete Masonry Industry methodology to support and protect the existing adjacent masonry, indicated to remain, which surrounds removal area. The Contractor shall remove the proper length of masonry and leave adjacent masonry in place to support existing masonry above the work in lengths indicated below.**
 - 1. Refer to BIA, Technical Note #46: "Maintenance of Brick Masonry", www.gobrick.com/Portals/25/docs/Technical%20Notes/TN46.pdf, for two recommended methods to properly support existing brickwork when installing new mechanically keyed through wall flashing, and as indicated below:
 - a. **Method 1:** Remove alternate sections of masonry in 2'-0" to 5'-0" (610 mm to 1.52m) lengths.
 - b. **Method 2:** Temporary braces can be installed to permit the removal of longer sections of masonry.

Note: The replaced masonry should be properly cured (5 to 7 days) before the intermediate masonry sections or supports are removed.
- B. General: Provide concealed flashing in masonry work at, or above, shelf angles, lintels, ledges and the base of perimeter cavity walls and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and

free from projections which could puncture flashing. Place through-wall flashing in wall and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar. Extend flashings through exterior face of masonry and turn down to form drip.

1. **Contractor shall provide concealed flashing in masonry at all required conditions, whether shown or not, and shall be typical and/or similar for all building conditions when details and notes are shown on drawings.**
 2. **Contractor shall provide spandrel beam membrane flashings for all steel beams exposed to cavity, whether shown or not, and shall be typical and/or similar for all building conditions when details and notes are shown on drawings.**
- C. Extend flashing the full length of ledges. Lap all flashing a minimum of 4 inches and seal laps with mastic or as recommended by manufacturer. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 8 inches, and through the inner wythe to within third of width of the inner wythe as indicated on drawings.
- D. Extend flashing the full length of lintels and shelf angles and minimum of 4 inches into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 8 inches, and through the inner wythe to within 1/2" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2 inches.
1. At heads and sills flashing shall extend 6 inches beyond each side of the opening and to be turned up at the sides/ends not less than 2 inches to form a pan, (end dam). All corners shall be folded, not cut.
- E. Lap all flashing a minimum of 4 inches and seal laps with mastic or as recommended by manufacturer.
- F. Provide weep holes in the head joints of the same course of masonry bedder in the flashing mortar. Space 24 inches o.c., unless otherwise indicated.
- G. Install reglets and nailers for flashing and other related work where shown to be built into masonry work.

3.11 QUALITY CONTROL TESTING

- A. Correct deficiencies in structural steel reinforcement and anchorage work which inspections and laboratory test reports have indicated to be not in compliance with requirements.
1. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

3.12 REPAIR, POINTING AND CLEANING

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

- B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.
- C. Clean exposed brick masonry surfaces by the bucket and brush hand cleaning method or by high pressure water method. Comply with requirements of BIA Technical Notes No. 20 "Cleaning Brick Masonry".
 - 1. Use commercial cleaning agents in accordance with manufacturer's instructions.
- D. Clean exposed CMU masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings. Comply with recommendations in NCMA TEK Bulletin No. 28.
 - 1. Prepare exposed to view CMU surfaces to receive paint coatings in accordance with Section 09900.

END OF SECTION 04200

SECTION 05400 - MISCELLANEOUS STRUCTURAL STEEL

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 DESCRIPTION OF WORK

- A. Definition: Miscellaneous structural steel includes items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of Structural Steel or other metal fabrication systems specified elsewhere.
- B. Extent of miscellaneous structural steel fabrications is indicated on drawings and schedule.
 - 1. Work of this section shall include miscellaneous structural steel framing and supports for wall and roof openings whether or not shown on architectural drawings.
 - a. Refer to architectural, mechanical and electrical drawings for the following:
 - 1) Locations and sizes of roof penetrations, roof top supported mechanical and electrical equipment, etc.
 - 2) Locations and sizes of wall penetrations, etc.
 - b. All miscellaneous structural steel supports shall be in accordance with typical structural steel details and schedules shown on architectural drawings and/or as directed by the Architect.
 - c. All miscellaneous structural steel supports shall meet indicated load requirements and/or as directed by the Architect.
 - d. In existing building(s) where alteration and/or renovation work is/are indicated, refer to Division 1 Sections for miscellaneous structural steel framing and supports which may be assigned to be provided and installed by other Trades.
- C. Types of work in this section include metal fabrications for:
 - 1. Loose Steel lintels, bearing and leveling plates and miscellaneous steel framing and supports.
- D. Related Sections:
 - 1. Section 01400 - Testing Laboratory Service
 - 2. Section 04200 - Unit Masonry
 - 3. Section 05500 - Metal Fabrications
 - 4. Section 09900 - Painting
 - 5. Division 23 - Mechanical Work

1.3 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrications might delay work.

- B. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Delegated Design:
 - 1. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated. Designated Design includes, but is not limited to:
 - a. Miscellaneous steel framing, metal framing, bearing plates and other components.
 - 2. Professional Engineer Qualifications: A professional engineer legally authorized to practice in the jurisdiction where the Project is located, (State of New Jersey), and experienced in providing engineering services of the kind indicated that have resulted in the installation of structural assemblies, similar to this Project in material, design, and extent and that has a record of successful in-service performance. Provide analysis data and signed & sealed documents.
 - 3. Conform to all applicable State and Local Codes for design loads and all other requirements.
 - 4. Refer to paragraph 1.4 - SUBMITTALS (below).
- D. 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 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous steel fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.
 - 1. Submit shop drawings for miscellaneous steel framing and supports. Signed and sealed shop drawings shall be submitted by a qualified professional Structural Engineer, licenced in the state where the project is located
- C. Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural computations, material properties and other information needed for structural analysis.
- D. Samples: Submit 2 sets of representative samples of materials and finished products as may be requested by Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Metal Surfaces, General: For fabrication of miscellaneous structural steel work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Steel
 - 1. Steel Plates, Shapes and Bars: ASTM A36.
 - 2. Structural Steel Sheet: Hot-rolled, ASTM A570; or cold-rolled ASTM A611, Class 1; of grade required for design loading.
 - 3. Galvanized Structural Steel Sheet: ASTM A446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.
 - 4. Steel Pipe: ASTM A53; Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.
- C. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- D. Grout:
 - 1. Metallic Non-Shrink Grout: Pre-mixed, factory-packaged, ferrous aggregate grout complying with CE CRD-C588, Type M.
 - 2. Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- E. Fasteners:
 - 1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
 - 2. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A.
 - 3. Lag Bolts: Square head type, FS FF-B-561.
 - 4. Machine Screws: Cadmium plated steel, FS FF-S-92.
 - 5. Wood Screws: Flat head carbon steel, FS FF-S-111.
 - 6. Plain Washers: Round, carbon steel, FS FF-W-92.
 - 7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.

F. Paint:

1. Surface Preparation: SSPC-2P6 commercial Blast Cleaning.
2. Primer: Tnemec Series 90-97 Tneme-Zinc, or equal, @ 2.5 - 3.5 mils (dry)
3. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Section 09900.

2.2 FABRICATION, GENERAL

- A. Workmanship: Use materials of size and thickness indicated, or if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- C. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts.
- E. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- F. Galvanizing:
1. Provide a zinc coating for exterior items and those items indicated or specified to be galvanized, as follows:
 - a. ASTM A 153 for galvanizing iron and steel hardware.
 - b. ASTM A 123 for galvanized rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.
 - c. ASTM A 386 for galvanizing assembled steel products.
- G. Shop Painting
1. Shop paint miscellaneous structural steel, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated.
 2. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC SP-6.

3. Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions. Use painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.
4. Apply one shop coat to fabricated metal items, except apply two coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in masonry construction. Coordinate delivery of such items to project site.
 1. Coordinate work of this section with other work affected by other Trades.
 2. Obtain locations, opening sizes, weighs and other required information from affected trades.
 3. Comply with coordination requirements indicated in Division 1 Sections.

3.2 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors, as required.
- B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plus, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.
- C. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.
- E. Set loose lintels, leveling and grouting as for plates. Allow sufficient time for scheduling the installation.

3.3 ADJUST AND CLEAN

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting.
- B. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- C. For galvanize surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

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 DESCRIPTION OF WORK

- A. Definition: Metal fabrications include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere and non-ferrous items listed herein.
- B. Type of work in this section includes metal fabrications for assemblies which include but are not limited to the following:
 - 1. Rough hardware.
 - 2. Miscellaneous structural shapes.
 - 3. Aluminum pipe railing and handrails.
 - 4. Guy wire roof support.
 - 5. Post installed anchors.
- C. Related Work:
 - 1. Section 03300 - Concrete Work.
 - 2. Section 04200 - Unit Masonry.
 - 3. Section 05120 - Structural Steel.
 - 4. Section 05300 - Metal Decking.
 - 5. Section 05400 - Miscellaneous Structural Steel.
 - 6. Section 09900 - Painting.

1.3 QUALITY ASSURANCE

- A. Codes and Standards:

ASTM A108-99 - Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.

ASTM A123 - Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

ASTM A276-03 - Standard Specification for Stainless Steel Bars and Shapes.

ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

ASTM A563-00 - Standard Specification for Carbon and Alloy Steel Nuts.

ASTM A569/A569M-91a – Standard Specification for Steel, Carbon (.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality (superseded by A1011).

ASTM A780-01 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

ASTM A1011/A1011M-03 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

ASTM F844-00 - Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

AWS D1.1/D1.1M: Structural Welding Code - Steel, Welding qualification procedures and personnel.

- B. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrications might delay work.
- C. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- D. Regulatory Requirements: Products and finished installations to be used by persons with disabilities must comply with requirements of the Uniform Construction Code, American National Standard, Accessible and Usable Buildings and Facilities, ICC / ANSI A117.1.
- E. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in New Jersey where Project is located and who is experienced in providing engineering services of the type indicated.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.
- C. Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural computations, material properties and other information needed for structural analysis.
- D. Samples: Submit 2 sets of representative samples of materials and finished products as may be requested by Architect.

- E. Mill test reports: Reports indicating metals to be furnished comply with project requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Aluminum: Comply with the following standards for the forms and types of aluminum for the required items of work.
 - 1. Alloy and Temper: Provide alloy and temper as recommended by the aluminum producer or finisher, with not less than the strength and durability properties specified in ASTM B 632/B 632 M, alloy 6061-T6.
 - 2. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of the metal to be welded, and as required for color match, strength and compatibility in the fabricated items.
 - 3. Fasteners: Finish of basic metal and alloy, matching finished color and texture as the metal being fastened, unless otherwise indicated. Unless otherwise shown, provide Phillips flat-head screws for exposed fasteners.
 - 4. Bituminous Paint: SSPC-Paint (cold-applied asphalt mastic).
 - 5. Protective Lacquer: Clear non-yellowing, of type recommended by metal producer for protection of the finished metal surfaces.
 - 6. Aluminum Pipe and Tube: ASTM B429, Alloy 6063-T6.
 - 7. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
 - 8. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
 - 9. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.
- C. Steel
 - 1. Steel Plates, Shapes and Bars: ASTM A36/A 36M.
 - 2. Structural Steel Sheet: Hot-rolled, ASTM A570; or cold-rolled ASTM A611, Class 1; of grade required for design loading.
 - 3. Galvanized Structural Steel Sheet: ASTM A446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.
- D. Gray Iron Castings: ASTM A48, Class 30.

- E. Malleable Iron Castings: ASTM A47, grade as selected by fabricator.
- F. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- G. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A153.
- H. Grout:
 - 1. Non-Shrink, Metallic Grout: Pre-mixed, factory-packaged, ferrous-aggregate grout complying with CE CRD-C588, Type M, and ASTM C1107, specifically recommended by manufacturer for heavy-duty loading applications and not to be used in wet areas or on exterior applications.
 - 2. Non-Shrink, Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621, and ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- I. Fasteners:
 - 1. General: Provide zinc-plated fasteners complying with ASTM B633, Class Fe/Zn 5, for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
 - 2. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A, with hex nuts, ASTM A563; and where needed, flat washers.
 - 3. Weathering Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A325, Type 3, with hex nuts, ASTM A563, Grade C3; and where needed, flat washers.
 - 4. Lag Screws: Square head type, ASME B18.2.1.
 - 5. Machine Screws: Cadmium plated steel, ASME B18.6.3.
 - 6. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
 - 7. Plain Washers: Round, carbon steel, ASME B18.22.1.
 - 8. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
 - 9. Expansion Anchors: Anchor bolt and sleeve assembly; Carbon-steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
 - 10. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as needed.
 - 11. Eyebolts: ASTM A 489.

12. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.
 13. Anchor Bolts: ASTM F 1554, Grade 36, of dimension indicated; with nuts, ASTM A563; and where indicated, flat washers.
- K. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
- L. Cast-in-Place in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.
- M. Post-Installed Anchors:
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel is indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 and nuts, ASTM F594.
- N. Paint:
1. Metal Primer Paint: Red lead mixed pigment, alkyd varnish, linseed oil paint, FS TT-P-86I, Type II; or red lead iron oxide, raw linseed oil, alkyd paint, Steel Structures Painting Council (SSPC) Paint 2-64; or basic lead silico chromate base iron oxide, linseed oil, alkyd paint, FS TT-P-615, Type II.
 2. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Section 09900.
 3. Galvanizing Repair Paint: High-zinc-dust content paint for regalvanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships) or SSPC-Paint-20 and compatible with paints specified to be used over it.

2.2 FABRICATION, GENERAL

- A. Workmanship
1. Use materials of size and thickness indicated, or if not indicated, as required, to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.
 2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise

indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

3. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts.
5. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
6. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

B. Galvanizing:

1. Provide a zinc coating for exterior steel items and those items indicated or specified to be galvanized, as follows:
 - a. ASTM A 153 for galvanizing iron and steel hardware.
 - b. ASTM A 123 for galvanized rolled, pressed and forged steel angles, corner guards, other indicated shapes, plates, bars, bollards and strip 1/8" thick and heavier.
 - c. ASTM A 386 for galvanizing assembled steel products.

C. Shop Painting

1. Shop paint miscellaneous metal work, except members of portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated.
2. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 "Hand Tool Cleaning", or SSPC SP-3 "Power Tool Cleaning", or SSPC SP-7 "Brush-Off Blast Cleaning".
3. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning".
4. Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions, and at a rate to provide uniform dry film thickness of 2.0 mils for each coat. Use painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.
5. Apply one shop coat to fabricated metal items, except apply two (2) coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.4 MISCELLANEOUS METAL FABRICATIONS

A. Rough Hardware

1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items as specified in Division-6 sections.
2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

B. Miscellaneous Structural Shapes, Framing and Supports, Etc.

1. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.
2. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricated from structural steel shapes, plates and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
3. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
4. Galvanize exterior miscellaneous frames and supports.

C. Aluminum Pipe Railing and Handrails:

1. Aluminum Railings and Handrails: Basis of Design: "Majestic Series", or as selected by the Architect as manufactured by AVCON; Ameristar Perimeter Security, USA; Integrity Aluminum Products, LLC; or approved equal.
2. Provide handrails to comply with applicable State and Local Regulatory Requirements and in accordance with minimum requirements indicated in the Uniform Construction Code, American National standard, Accessible and Usable Buildings and Facilities, ICC / ANSI A117.1.
3. Structural Performances: Provide railing and handrail assemblies which, when installed, shall comply ASCE standards for minimum design loads for Handrail assemblies and Guardrail Systems and capable of withstanding the following loads applied as indicated:
 - a. To resist a load of 50 pound per linear foot applied in any direction at the top and to transfer this load through the supports to the structure.
 - b. To resist a single concentrated load of 200 pounds applied in any direction at any point along the top, and have attachment devices and supporting structure to transfer this loading to the building structural assemblies, walls, floors or slabs. This load shall act concurrently with loads indicated in paragraph "a" above.

- c. Guards: Intermediate rails and balusters capable of withstanding a horizontal concentrated load of 200 lb. applied on a one square foot area at any point in system of gross area of guard, including any open areas, of which they are a part. Load need not be assumed to be acting concurrently with uniform horizontal loads on top rails of railing assembly in determining stress on guard supporting members.
 - d. Guards shall be designated and constructed for a uniform load of 50 pounds per foot applied horizontally at required guardrail height and a simultaneous uniform load of 100 pounds applied vertically downwards at top of guardrail.
 - e. In-fill Area:
 - 1) Concentrated Load: 200 pounds, horizontal load , applied on a 1square-foot area at any point in the system, including intermediate rail or other elements serving this purpose.
 - 2) This loading condition shall not be applied simultaneously with loading conditions indicated above, (a. b. and c.).
4. Fabricate pipe railings and handrails to design, dimensions, and details indicated. Provide railings and handrails members formed of pipe of sizes and wall thickness indicated, or if not shown, as required to support indicated design loading. Unless otherwise indicated all shown dimensions for pipes, rails and other round shapes are outside diameter.
 5. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
 - a. At tee and cross intersections provide coped joints.
 - b. At bends interconnect pipe by means of prefabricated elbow fittings or flush radius bends, as applicable, of radiuses indicated.
 - c. Perform welding to comply with applicable AWS specifications, using method appropriate for metal and finish indicated. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.
 6. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of pipe.
 7. Provide wall returns at ends of wall-mounted handrails, except where otherwise indicated.
 8. Close exposed ends of pipe by welding 3/16" thick aluminum plate in place or by use of prefabricated fittings.
 9. Brackets, Flanges, Fittings and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings and anchors for interconnections of pipe and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.
 10. Finish: Provide clear anodized finish.

2.4 MISCELLANEOUS MATERIALS

A. Injectable Mortar: Provide and install injectable mortar at all post-installed anchors, as follows:

1. Except where indicated on the drawings, post-installed anchors shall consist of the following anchor types as provided by Hilti, Inc.; or approved equal.
 - a. Anchorage to Concrete
 - 1) Adhesive anchors for cracked and uncracked concrete:
 - a) Hilti HIT-HY 200 Safe Set System with Hilti HIT-Z ROD per ICC ESR-3187.
 - b) Hilti HIT-HY 200 Safe Set System with Hilti Hollow Drill Bit System with HAS-E threaded rod per ESR-3187.
 - c) Hilti HIT-RE 500-SD Epoxy Adhesive Anchoring System with HAS-E Threaded Rod per ICC ESR-2322 for slow cure applications.
 - 2) Medium duty mechanical anchors for cracked and uncracked concrete:
 - a) Hilti KWIK HUS-EZ and KWIK HUS EZ-I Screw Anchors per ICC ESR-3027.
 - b) Hilti KWIK BOLT-TZ Expansion Anchors per ICC ESR-1917.
 - c) Hilti KWIK BOLT 3 Expansion Anchors (uncracked concrete only) per ICC ESR-2302.
 - 3) Heavy Duty mechanical anchors for cracked and uncracked concrete:
 - a) Hilti HDA Undercut Anchors per ICC ESR 1546.
 - b) Hilti HSL-3 Expansion Anchors per ICC ESR 1545.
 - b. Rebar Doweling into Concrete
 - 1) Adhesive anchors for cracked and uncracked concrete use:
 - a) Hilti HIT-HY 200 Safe Set System with Hilti Hollow Drill Bit System with continuously deformed rebar per ICC ESR-3187.
 - b) Hilti HIT-RE 500-SD Epoxy Adhesive Anchoring System with continuously deformed rebar per ICC ESR-2322.
 - c. Anchorage to Solid Grouted Masonry
 - 1) Adhesive Anchors:
 - a) Hilti HIT-HY 70 Masonry Adhesive Anchoring System (ICC pending).
 - b) Steel anchor element shall be Hilti HAS-E Continuously Threaded Rod or continuously deformed steel rebar.
 - 2) Mechanical Anchors:
 - a) Hilti KWIK HUS-EZ Screw Anchor per ICC ESR-3056.
 - b) Hilti KWIK BOLT-3 Expansion Anchors per ICC ESR-1385.
 - d. Anchorage to Hollow/Multi-Wythe Masonry
 - 1) Adhesive Anchors:
 - a) Hilti HIT-HY 70 Masonry Adhesive Anchoring System per ICC ESR-3342.
 - b) Steel anchor element shall be Hilti HAS-E Continuously Threaded Rod or continuously deformed steel rebar.
 - c) The appropriate size screen tube shall be used per adhesive Manufacturer's recommendation.
2. Anchor capacity used in design shall be based on the technical data published by Hilti or such other method as approved by the Architect/Structural Engineer. Substitution requests for alternate products must be approved in writing by the Architect/Structural Engineer. Contractor shall provide calculations demonstrating that the substituted

product is capable of achieving the performance values of the specified product. Substitutions will be evaluated by their having an ICC ESR showing compliance with the relevant building code for seismic uses, load resistance, installation category, and availability of comprehensive installation instructions. Adhesive anchor evaluation will also consider creep, in-service temperature and installation temperature.

3. Install anchors per the manufacturer instructions, as included in the anchor packaging.
4. Overhead adhesive anchors must be installed using the Hilti Profi System.
5. The Contractor shall arrange an anchor manufacturer's representative to provide onsite installation training for all of their anchoring products specified. The Architect/Structural Engineer must receive documented confirmation that all of the Contractor's personnel who install anchors are trained prior to the commencement of installing anchors.
6. Anchor capacity is dependant upon spacing between adjacent anchors and proximity of anchors to edge of concrete. Install anchors in accordance with spacing and edge clearances indicated on the drawings.
7. Existing reinforcing bars in the concrete structure may conflict with specific anchor locations. Unless noted on the drawings that the bars can be cut, the Contractor shall review the existing structural drawings (if available) and shall undertake to locate the position of the reinforcing bars at the locations of the concrete anchors, by Hilti Ferrosan, GPR, X-Ray, chipping or other means.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION

- A. General
 1. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
 2. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plus, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

3. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
 4. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.
- B. Setting Loose Lintels and Plates:
1. Clean masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
 2. Set Loose Lintels, leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.
 3. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain

3.3 PIPE RAILINGS AND HANDRAILS

- A. Adjust railing prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
- B. Anchor posts in concrete by means of sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.
1. Leave anchorage joint exposed; wipe off excess grout and leave 1/8 inch build-up, sloped away from post. For installation exposed on exterior or to flow of water, seal grout to comply with grout manufacturer's directions.
- C. Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.
- D. Anchor rail ends to steel with aluminum oval or round flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.
- E. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2" clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required for design loading. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
- F. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
- G. For hollow masonry anchorage, use toggle bolts having square heads.

3.4 ADJUST AND CLEAN

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.8 mils.
- B. For galvanize surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint.

END OF SECTION 05500

SECTION 06100 - CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Type of work in this section includes rough carpentry for:
 1. Wood nailers and blocking,
 2. Rough hardware,
 3. Construction panels.

1.3 SUBMITTALS

- A. Material Certificates: Where dimensional lumber is provided to comply with minimum allowable unit stresses, submit listing of species and grade selected for each use, and submit evidence of compliance with specified requirements. Compliance may be in form of a signed copy of applicable portion of lumber producer's grading rules showing design values for selected species and grade. Design values shall be as approved by the Board of Review of American Lumber Standards Committee.
- B. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storing, installation and finishing of treated material.
- C. Fire-Retardant Treatment: Include certification by treating plant that treated material complies with specified standard and other requirements.

1.4 PRODUCT HANDLING

- A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.
- B. Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.5 PROJECT CONDITIONS

- A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

- B. Maintain temperature and humidity in installation areas as required to maintain moisture content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity conditions.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Lumber Standards: Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
- B. Inspection Agencies: Inspection agencies and the abbreviations used to reference with lumber grades and species include the following:
 - WWPA - Western Wood Products Association.
- C. Factory-mark each piece of lumber with type, grade, mill and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.
- D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
- E. Provide dressed lumber, S4S, unless otherwise indicated.
- F. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing.

2.2 MISCELLANEOUS LUMBER

- A. Provide wood for support or attachment of other work including cant strips, nailers, blocking, and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:
 - 1. Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
 - 2. Grade: Construction Grade light framing size lumber of any species or board size lumber as required. Provide construction grade boards or No. 2 Boards.

2.3 CONSTRUCTION PANELS

- A. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood panels and, for products not manufactured under PS 1 provisions, with American Plywood Association (APA) "Performance Standard and Policies for Structural-Use Panels", Form No. E445.
- B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

- C. Concealed APA Performance-Rated Panels: Where construction panels will be used for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements indicated for grade designation, span rating, exposure durability classification, edge detail (where applicable) and thickness.
- D. APA RATED SHEATHING
 - 1. Exposure Durability Classification: EXTERIOR.
 - a. Span Rating: As required to suit joist spacing indicated.
- E. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.
 - a. For enclosed roof framing, framing in attic spaces, and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

2.4 MISCELLANEOUS MATERIALS

- A. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.
- B. Where rough carpentry work is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).
- C. Building Paper: ASTM D 226, Type I; asphalt saturated felt, non-perforated, 15-lb. type.

2.5 WOOD TREATMENT BY PRESSURE PROCESS

- A. Fire-Retardant Treatment: Where fire-retardant treated wood ("FRT") is indicated or required, pressure impregnate lumber and plywood with fire-retardant chemicals to comply with AWPA C20 and C27, respectively, identify "FRT" lumber with appropriate classification marking of Underwriters Laboratories, Inc., U.S. Testing, Timber Products Inspection or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire treated wood shall have a flame spread of 25 or less and shall be dried to 19% moisture content for lumber and 15% for plywood. Exposed wood or wood subject to high humidity conditions shall be identified that the moisture content shall not exceed 28% when tested at 92% relative humidity in accordance with ASTM D3201.
 - 2. Treatment products: The following products, provided they comply with requirements of the contract documents will be among those considered acceptable:
 - a. "Dricon"; Hickson Corporation.
 - b. "Flame Proof LHC"; Osmose Wood Preserving, Inc.
 - c. "Pyro-Guard"; Hoover Treated Wood Products, Inc.
 - d. Or approved equal.
 - 3. Treat members shown on drawings and/or as required to meet the code requirements.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.
- B. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.
- C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.
- D. Countersink nail heads on exposed carpentry work and fill holes.
- E. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

3.2 WOOD NAILERS AND BLOCKING

- A. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
- B. Height of nailers shall be matched to that of the insulation being used. Nailers shall be firmly anchored to the deck to resist a force of seventy-five pounds per lineal foot. The type of

anchors shall be as recommended by the roofing manufacturer and shall be secured at intervals required to ascertain a resistance force of seventy-five pounds per lineal foot.

3.3 INSTALLATION OF CONSTRUCTION PANELS

- A. General: Comply with applicable recommendations contained in Form No. E 30F, "APA Design/Construction Guide - Residential & Commercial," for types of construction panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Sheathing: Screw to framing or substrates.

END OF SECTION 06100

SECTION 06650 - SOLID POLYMER FABRICATIONS

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. Section Includes: Countertops.

1.3 SUBMITTALS

- A. Product Data: Written technical information for unit specified. Indicate product description, fabrication information and compliance with specified performance requirements.
- B. Shop Drawings:
 - 1. Submit rough-in drawings. Include the following details and all other information necessary to demonstrate compliance with contract documents:
 - a. Dimensions.
 - b. Required clearances.
 - c. Methods of assembling components.
 - d. Anchorages.
 - e. Coordination requirements with adjacent work.
- C. Samples: Submit minimum 2 inch by 2 inch samples. Indicate full range of colors and pattern variation. Approved samples will be retained as a standard for work.
- D. Certificates: Submit certification that work complies with requirements of contract documents.
- E. Manufacturer's Instructions: Submit for each product specified in this section.
 - 1. Include installation instructions and instructions for examination, preparation, and protection of adjacent work.
- F. Maintenance Data: Submit manufacturer's care and maintenance data, including care, repair and cleaning instructions and maintenance video.
 - 1. **Provide maintenance kit for indicated finishes. Include in project close-out documents.**

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Deliver no components to project site until areas are ready for installation. Store indoors.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.5 QUALITY ASSURANCE:

- A. Allowable Tolerances: Variation in component size: ±1/8 inch.

1.6 WARRANTY:

- A. Provide manufacturer's warranty against defects in materials, fabrication and installation, excluding damages caused by physical or chemical abuse or excessive heat. Warranty shall provide for replacement or repair of material and labor for a period of **ten (10) years**, beginning at Date of Substantial Completion.
 - 1. For fabrications with installed warranty coverage, identify by affixing manufacturer's fabrication/installation source plate.

PART 2 - PRODUCTS

2.1 SOLID POLYMER FABRICATIONS:

- A. Basis of Design: Corian Surfaces as manufactured by Du Pont De Nemours & Co., Inc.; or approved equal.
- B. Subject to compliance with indicated requirements manufacturers offering products which may be incorporated in the work include the following:
 - 1. Meganite Inc.: Manufacturer’s Rep: Richelieu Hardware,
 - 2. LG Solid Surfaces,
 - 3. Wilsonart: Manufacturer’s Rep: Fessenden Hall Inc.,
 - 4. Avonite Surfaces,
 - 5. Or approved equal.
- C. Material: Cast, filled, acrylic; not coated, laminated or of composite construction, meeting ANSI Z124 1980, Type Six, and FS WW-P-541E/GEN dated August 1, 1980.

2.2 PERFORMANCE CHARACTERISTICS:

<u>PROPERTY</u>	<u>REQUIREMENT</u> (min/max)	<u>TEST PROCEDURE</u>
Tensile Strength	5000 psi min	ASTM D638
Tensile Modulus	1.0 x 10 ⁶ psi min	ASTM D638
Flexural Strength	7000 psi min	ASTM D790
Flexural Modulus	1.0 x 10 ⁶	ASTM D790
Elongation	0.3% min.	ASTM D638
Strain at Break	0.8% min.	ASTM D638
Hardness	90-Rockwell "M" scale 52-Barcol Impressor min.	ASTM D758

Thermal Expansion	3.5 x 10 ⁻⁶ in/in/deg C max 1.95 x 10 ⁻⁶ in/in/deg F max	ASTM D696
Color Stability	No change, min. 100 hours	NEMA LD3-3.10
Wear and Cleanability	Passes	ANSI Z124.3
Abrasion Resistance	No loss of pattern Weight loss (1000 cycles)=0.9 g. max.	NEMA LD3-3.01 ANSI Z124.3
Boiling water Surface Resistance	No Change	NEMA LD3-3.05
High Temperature Resistance	No Change	NEMA LD3-3.06
Conductive Heat Resistance	No Change	NEMA LD3-3.08
Impact Resistance Notched Izod	0.24 ft.-lbs./in. of notch min.	ASTM D256, Method A
Gardner	9.0 ft-lbs min.	ASTM D3029
Ball drop 1/4" sheet	36" min. with 1/2 lb ball, no failure	NEMA LD3-303
1/2" sheet	140" min. with 1/2 lb ball, no failure	
3/4" sheet	200" min. with 1/2 lb ball, no failure	
Stain Resistance	Passes	ANSI Z124.3
Weatherability	No change, min. 1000 hours	ASTM D1499-84
Fungi and Bacteria	No Attack	ASTM G21, ASTM G22
Specific Gravity	1.6 min.	

FVHD-5162C

2:06650-3

Water Absorption Weight (% max.)	24 hrs.	Long Term	ASTM D570
	0.05 (1/4") max.	0.50 (1/4") max.	
	0.10 (3/4") max.	0.90 (3/4") max.	

Flammability ASTM E84

	Solid Colors		
	1/4"	1/2"	3/4"
Flame spread	25 max	25 max	25 max
Smoke Developed	30 max	30 max	30 max
Class	1	1	1

Particulate Patterns

	1/4"	1/2"	3/4"
Flame spread	25 max	25 max	25 max
Smoke Developed	30 max	30 max	30 max
Class	1	1	1

Pittsburgh Protocol Toxicity (as used by NY state)	solids-80 grams min. particulate patterns-65 grams min.	"LC50" Test
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2.3 ACCESSORY PRODUCTS

- A. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints by chemical bond.
- B. Panel Adhesive: Manufacturer's standard neoprene-based panel adhesive complying with ANSI A136.1-1967, UL listed.
- C. Sealant: Manufacturer's standard mildew-resistant, FDA, UL listed silicone sealant in colors matching components.

2.4 FABRICATION:

- A. Factory fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed Instructions and technical bulletins.

- B. Form joints between components using manufacturer's standard joint adhesive; without conspicuous joints. Reinforce with strip of solid polymer material, 2" wide.
- C. Rout and finish component edges with clean, sharp returns. Rout cutouts, radii and contours to template. Smooth edges. Repair or reject defective and inaccurate work.
- D. Countertops: ½-inch thick solid polymer material, adhesively joined with inconspicuous seams, edge as indicated on the drawings, unless otherwise shown on the Drawings.
 - 1. Provide surfaces with a uniform finish, Matte, Gloss range of 5-20. Color to be selected from manufacturer's Color Group - 1 - 5.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Prior to final approval of shop drawings, erect at project site one full size mock-up of each component required, for Architect's review.
- B. Should mock-up not be approved, re-fabricate and reinstall until approval is secured. Remove rejected units from project site.
- C. Approved mock-ups may remain as part of finished work.

3.2 INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Reinforce joints as required.
- C. Perform installation in accordance with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.

3.3 CLEANING

- A. Clean shop finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas, as acceptable to Architect.

3.4 PROTECTION

- A. Contractor to take all precautions as recommended by the manufacturer for protection of installed window stools and other solid plastic products from damage by work of other trades.

END OF SECTION 06650

SECTION 07200 - BUILDING 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 DESCRIPTION OF WORK

- A. Work included in this Contract: Contractor shall include all labor, materials, services, installation, equipment, etc., necessary to complete all building insulation (except roof insulation) to achieve complete and tight building thermal barrier to prevent the passage of exterior air into conditioned spaces and prohibit the formation of condensation.
 - 1. Provide indicated types of insulation as shown on drawings, as specified herein, and/or as required by all job conditions and building assemblies, whether clearly shown or not to achieve included work.
 - 2. Insulation types include but are not limited to the following:
 - a. Rigid board type cavity wall insulation,
 - b. Fire safing insulation with UL approved coating,
 - 3. Related Work:
 - a. Section 04200 - Unit Masonry,
 - b. Section 07840 - Through-Penetration Firestop Systems,

1.3 QUALITY ASSURANCE

- A. Thermal Conductivity: Thicknesses shown are for thermal conductivity (k-value at 75°F) specified for each material. Provide adjusted thicknesses as directed for equivalent use of material having a different thermal conductivity. Where insulation is identified by "R" value, provide appropriate thicknesses.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.
- C. Fire and Insurance Ratings: Comply with fire-resistance, flammability and insurance ratings indicated, and comply with governing regulations as interpreted by authorities.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature and installation instructions for each type of insulation required. Include data substantiating that materials comply with specified requirements.
- B. Samples: Submit triplicate samples of the following listed items, in accordance with Contract Documents. Obtain Architect's approval before proceeding with ordering or fabrication of items of this section:
 - 1. Each type of insulation specified - 12 inches square.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General Protection and Handling: Protection from Deterioration: Do not allow insulation materials to become wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Extruded-Polystyrene Board Insulation:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company.
 - c. Owens Corning.
 - d. Tenneco Building Products.
 - e. Or approved equal.
 - 2. Fire Safing Insulation:
 - a. Industrial Insulation Group, LLC
 - b. Fibrex Insulations.
 - c. Isolatek International.
 - d. Owens Corning.
 - e. Roxul USA Inc.
 - f. Or approved equal.
- B. Mineral-Wool Board Insulation:
 - 1. Semi-Refractory Fiber Board Fire Safing Insulation: Semi-rigid boards designed for use as a fire stop at openings between edge of slab and exterior wall panels, at top of masonry and wallboard walls/deck interface, and shall be produced by combining semi-refractory mineral fiber manufactured from slag with thermosetting resin binders.
 - 2. Unfaced, Mineral-Wool Board Insulation: ASTM C 612; with a flame-spread index of 15 and a smoke-developed index of zero, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - a. Nominal density of 4 lb/cu. ft., Types IA and IB, thermal resistivity of 4°F x h x sq. ft./Btu x in. at 75°F.

3. At all rated masonry and wallboard walls and partitions, rated slabs and exterior wall panels, the fire safing insulation shall be coated with 3M Firedam products, or approved equal, to achieve indicated UL design requirements.

C. Rigid Insulation (cavity wall insulation)

1. Rigid, moisture resistant, closed-cell extruded polystyrene insulation board; ASTM C578, Type IV, 25 psi compressive strength; 1.1 perm-inch maximum vapor transmission; 0.3% maximum water absorption; manufacturer's standard lengths and widths. Provide insulation complying with a flame spread rating of 0 and smoke developed of 155, when tested in accordance with ASTM E84.
 - a. Basis of Design: Provide "Cavitymate Ultra", by Dow Chemical Co., U.S.A.; or approved equal.
 - 1) Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a) DiversiFoam Products.
 - b) Owens Corning.
 - c) Tenneco Building Products.
 - d) Or approved equal.
 - b. R-value based on ASTM C518:
 - 1) 10.0 @ 75°F
 - 2) 10.8 @ 40°F
 - 3) 11.2 @ 25°F
 - c. Thickness: 1-3/4", unless indicated otherwise.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
 1. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.
 2. Provide complete and tight building thermal barrier, to prevent the passage of exterior air into conditioned spaces and prohibit the formation of condensation.
 3. Provide indicated types of insulation as shown on drawings, as specified herein, and/or as required by all job conditions, building assemblies, and whether clearly shown or not.
 4. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

C. Cavity Wall Insulation

1. On units of plastic insulation, install small pads of mortar or mastic spaced approximately 1'-0" on center both ways on inside face, as recommended by manufacturer. Press courses of insulation between wall ties and other confining obstructions in the cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
 - a. Wedge insulation from outside wythe of construction with small fragments of masonry materials spaced 2'-0" on center both ways.

D. Fire Safing Insulation

1. Install fire safing insulation at all indicated locations, as required by authorities having jurisdiction and in accordance with manufacturer's instructions.
2. Provide sealant material and type required for indicated applications. Provide fire rated type at rated assemblies.
3. Provide coating materials at indicated UL rated assemblies.

- E. All installations of insulation and work of this section shall meet approval of Architect and all code authorities having jurisdiction at no additional cost to the Owner.

END OF SECTION 07200

SECTION 07270 - FLUID APPLIED AIR / VAPOR BARRIERS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. The General Conditions, Supplementary Conditions, Instructions to Bidders, and Division 01- General Requirements shall be read in conjunction with and govern this section.
- B. The Specification shall be read as a whole by all parties concerned. Each Section may contain more or less than the complete Work of any trade. The Contractor is solely responsible to make clear to the installing Subcontractor the extent of their Work.

1.02 SUMMARY

- A. This Section includes requirements for supplying labor, materials, tools, and equipment to complete the Work, as shown on the Drawings and as specified herein including, but not limited to, the following:
 - 1. Adhesive/Primer
 - 2. Fluid Applied Impermeable Air and Vapor Barrier
 - 3. Air Barrier/Thru-wall Flashing
 - 4. Sealant
 - 5. Insulation Adhesive

1.03 RELATED SECTIONS

- A. Section 04200 - Unit Masonry
- B. Section 07200 - Building Insulation
- C. Section 07600 - Flashing, Sheet Metal and Roofing Accessories
- D. Section 07900 - Joint Sealer Assemblies
- E. Section 08415 - Aluminum Storefront

1.04 SUBSTITUTIONS

- A. Submit requests for substitutions in accordance with AIA A201 and Section 00800.
- B. Substitution submission format to include:
 - 1. Evidence that alternate materials meet or exceed performance characteristics of product requirements and documentation from an approved independent testing laboratory certifying that the performance of the system including auxiliary components exceed the requirements of the local building code.

2. References clearly indicating that the Air / Vapor Barrier Manufacturer has successfully completed projects of similar scope and nature on an annual basis for a recommended minimum of ten (10) years.
 3. Air / Vapor Barrier Manufacturer's guide specification.
 4. Air / Vapor Barrier Manufacturer's complete set of technical data sheets for assembly.
 5. Air / Vapor Barrier Manufacturer's complete set of details for assembly.
 6. Product certification confirming assembly components are supplied and warranted by a single source Air / Vapor Barrier Manufacturer.
 7. Air / Vapor Barrier Manufacturer statement that anticipated wall assembly compliance with NFPA 285.
 8. Sample warranty, as specified.
- C. Submit requests for substitutions to this specification within fourteen (14) days following award date. Include a list of a recommended twenty (20) projects executed over the past five (5) years.
- D. Substitute materials not approved in writing shall not be permitted for use on this project.

1.05 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
1. AAMA 711-13 - Voluntary Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products
 2. AAMA 2400-02 - Standard Practice for Installation of Windows with a Mounting Flange in Stud Frame Construction
- B. American Society for Testing and Materials (ASTM):
1. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting
 2. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
 4. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials
 5. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen

6. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference
 7. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials
 8. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
- C. National Fire and Protection Agency (NFPA):
1. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.06 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation meetings:
1. When required, and with prior notice, an Air / Vapor Barrier Manufacturer representative will meet with the necessary parties at the jobsite to review and discuss project conditions as it relates to the integrity of the assembly.

1.07 SUBMITTALS

- A. Provide the following requested information in accordance with AIA A201 and Section 00800 - Submittal Procedures.
- B. Action Submittals:
1. Product Data:
 - a. Air / Vapor Barrier Manufacturer's guide specification.
 - b. Air / Vapor Barrier Manufacturer's complete set of technical data sheets for assembly.
 - c. Air / Vapor Barrier Manufacturer's complete set of guide details for assembly.
 2. Certificates:
 - a. Product certification confirming assembly components are supplied and warranted by a single source Air / Vapor Barrier Manufacturer.
 3. Tests and Evaluation Reports:
 - a. NFPA 285 wall assembly compliance:
 - 1) Air / Vapor Barrier Manufacturer statement that anticipated wall assembly complies with NFPA 285.
 4. Warranty:
 - a. Sample warranty, as specified.

1.08 QUALITY ASSURANCE

A. Single Source Responsibility:

1. Obtain air barrier and auxiliary materials including adhesive/primer, air barrier, flashings, and sealants from a single Air / Vapor Barrier Manufacturer regularly engaged in the manufacturing and supply of the specified products.
2. Contactor to verify product compliance with Federal, State, and Local regulations controlling use of Volatile Organic Compounds (VOC).

B. Manufacturer Qualifications:

1. Air / Vapor Barrier Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:
 - a. Air / Vapor Barrier Manufacturer must not issue warranties for terms longer than they have been manufacturing and supplying specified products for similar scope of Work.

C. Installer Qualifications:

1. Perform Work in accordance with the Air / Vapor Barrier Manufacturer's published literature and as specified in this section.
2. Maintain one (1) copy of the Air / Vapor Barrier Manufacturer's installation instructions on site.
3. At all times during the execution of the Work allow access to site by the Air / Vapor Barrier Manufacturer representative.
4. If meeting with the Air / Vapor Barrier Manufacturer during project construction, contact the Air / Vapor Barrier Manufacturer a minimum of two weeks prior to schedule meeting.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Materials shall be delivered to the jobsite in unopened, undamaged and clearly marked containers indicating the name of the Air / Vapor Barrier Manufacturer and product.

B. Storage of Materials:

1. Store materials as recommended by the Air / Vapor Barrier Manufacturer and conforming to applicable safety regulatory agencies. Refer to all applicable data including, but not limited to, SDS information, Product Data sheets, product labels, and specific instructions for personal protection.
2. Keep solvents away from open flame or excessive heat.

3. Store materials in original packaging.
 4. Protect rolls from direct sunlight until ready for use.
 5. Refer to Air / Vapor Barrier Manufacturer's published literature.
- C. Handling: Refer to Air / Vapor Barrier Manufacturer's published literature.

1.10 SITE CONDITIONS

- A. Environmental Requirements:
1. No Work shall be performed during rain or inclement weather.
 2. No Work shall be performed on frost covered or wet surfaces.
- B. Protection:
1. It is the responsibility of the installing Subcontractor to protect all surfaces not included in scope of Work from overspray including, but not limited to, windows, doors, adjacent areas, and vehicles.
 2. Cap and protect exposed back-up walls against wet weather conditions during and after application of membrane. Do not proceed with the application of the field air barrier until the roof has been installed.
- C. Ensure all preparation Work is completed prior to installing air barrier.
- D. All equipment shall be grounded during operations.

1.11 WARRANTY

- A. Manufacturer's Single Source Warranty:
1. Fluid Applied Air and Vapor Barrier:
 - a. Product Warranty: Manufacturer warrants the material against product defect for a period of **five (5) years** from date of purchase.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Air / Vapor Barrier and auxiliary materials must be obtained as a single-source from the Air / Vapor Barrier Manufacturer to ensure total system compatibility and integrity.
- B. Basis of Design: Henry® Co.; or approved equal.
1. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but are not limited to the following:

FVHD-5162C

2:07270-5

- a. Equivalent by GCP Applied Technologies;
- b. Equivalent by W.R. Meadows;
- c. Or approved equal.

2.02 MATERIALS

- A. Air / Vapor Barrier Primary Fluid-Applied, Air and Vapor Barrier - Basis of Design: Henry® Air-Bloc® 16MR, or approved equal:
 - 1. Fluid-applied vapor impermeable air and water barrier consisting of a single component water-based elastomeric formulation that cures to a tough monolithic rubber-like membrane; having the following typical physical properties:
 - a. Color: Gray
 - b. Water Vapor Permeance (ASTM E96 Method A): 0.03 perms
 - c. Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
 - d. Air Permeance (ASTM E2178): Pass
 - e. Elongation (ASTM D412): 270%
 - f. Tensile Strength (ASTM D412): 100 psi (689 kPa)
 - g. Surface Burning Characteristics (ASTM E84):
 - 1) Flame Spread: Class A
 - 2) Smoke Development: Class A
 - h. Minimum Application Temperature: 20F (-6°C)
 - i. Water Penetration Resistance Around Nails (ASTM D1970): Pass
 - j. Maximum VOC: 100 g/l
 - 2. Assembly Auxiliary Materials:
 - a. Adhesives/Primers:
 - 1) Low VOC adhesive:
 - a) Synthetic rubber based quick setting adhesive with low VOC content; having the following typical physical properties:
 - (1) Basis of Design: Henry® Blueskin® LVC Adhesive, or approved equal.
 - (2) Color: Blue
 - (3) Maximum VOC: <240 g/L
 - (4) Drying time (initial set): 30 minutes
 - (5) Low Application Temperature: 10F (-12°C)
 - 2) Quick setting primers:
 - a) Synthetic rubber based quick setting adhesive with low VOC content; having the following typical physical properties:
 - (1) Basis of Design: Henry® Blueskin® LVC Spray Primer, or approved equal.
 - (2) Color: Blue
 - (3) Maximum VOC: 250 g/L
 - (4) Dry time: 1-3 minutes
 - (5) Low Application Temperature: 40F (4.4°C)
 - b) Polymer emulsion water based quick setting adhesive with low VOC content; having the following typical physical properties:
 - (1) Basis of Design: Henry® Aquatac™ Primer, or approved equal.
 - (2) Color: Aqua
 - (3) Maximum VOC: 50 g/L

- (4) Drying time (initial set): 30 minutes
- (5) Low Application Temperature: 25F (-4°C)
- b. Liquid-Applied Flashing:
 - 1) Moisture-curing single component elastomeric liquid-applied flashing using a highly advanced Silyl-Terminated Polyether (STPE) polymer curing to a monolithic membrane; having the following typical physical properties:
 - a) Basis of Design: Henry® Air-Bloc® LF Liquid-Applied Flashing, or approved equal.
 - b) Color: Blue
 - c) Air Permeance (ASTM E2178): Pass
 - d) Water Vapor Permeance (ASTM E96): 21.8 perms @ 25 mils
 - e) Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
 - f) Water Resistance (AC212/ASTM D2247): Pass
 - g) Nail Sealability (AAMA 711): Pass
 - h) Surface Burning Characteristics (ASTM E84):
 - (1) Flame Spread: Class A
 - (2) Smoke Development: Class A
 - i) Elongation (D412): 264%
 - j) Low Application Temperature: 20F (-7°C)
- c. Self-Adhered Flashing:

Note: The following product is to be used in conjunction with the copper fabric flashing as specified in Section 04200. The self-adhered flashing shall overlap the copper fabric flashing.

- 1) Non-vapor permeable, self-adhered water resistive air and vapor barrier consisting of a synthetic butyl compound integrally laminated to a white engineered polypropylene film surface; having the following typical physical properties:
 - a) Basis of Design: Henry® Blueskin® Butyl Flash, or approved equal.
 - b) Color: White
 - c) Thickness: 14 mils (0.36 mm)
 - d) Water Vapor Permeance (ASTM E96): 0.14 perms
 - e) Nail Sealability (ASTM D1970): Pass
 - f) Elongation (ASTM D412): 825% minimum
 - g) Low Application Temperature: 25F (-4°C)
- 2) Non-vapor permeable, self-adhered water resistive air and vapor barrier consisting of an SBS rubberized asphalt compound integrally laminated to a high strength polyethylene with surface layer of metallic aluminum film; having the following typical physical properties:
 - a) Basis of Design: Henry® Metal Clad® Self-Adhered Water Resistive Air Barrier, or approved equal.
 - b) Color: Metallic Aluminum
 - c) Thickness: 45 mils (1.14 mm)
 - d) Water Vapor Permeance (ASTM E96): 0.014 perms
 - e) Nail Sealability (ASTM D1970): Pass
 - f) Elongation (ASTM D412): 85%
 - g) Low Application Temperature: 20F (-7°C)
- 3) Non-vapor permeable, self-adhered water resistive air and vapor barrier consisting of an SBS rubberized asphalt compound integrally laminated to a blue engineered thermoplastic film surface; having the following typical

- physical properties:
- a) Basis of Design: Henry® Blueskin® SA Self-Adhered Water Resistive Air Barrier, or approved equal.
 - b) Color: Blue
 - c) Thickness: 40 mils (1 mm)
 - d) Water Vapor Permeance (ASTM E96): 0.86 perms
 - e) Nail Sealability (ASTM D1970): Pass
 - f) Elongation (ASTM D412-modified): 200% minimum
 - g) Low Application Temperature: 41F (5C)
- 4) Low temperature non-vapor permeable, self-adhered water resistive air and vapor barrier consisting of an SBS rubberized asphalt compound integrally laminated to a blue engineered thermoplastic film surface; having the following typical physical properties:
- a) Basis of Design: Henry® Blueskin® SA LT Low Temp Self-Adhered Water Resistive Air Barrier, or approved equal.
 - b) Color: Blue
 - c) Thickness: 40 mils (1 mm)
 - d) Water Vapor Permeance (ASTM E96): 0.86 perms
 - e) Nail Sealability (ASTM D1970): Pass
 - f) Elongation (ASTM D412-modified): 200% minimum
 - g) Low Application Temperature: 10F (-12C)
- d. Sealants:
- 1) Building Envelope Sealant:
 - a) Moisture cure, medium modulus polymer modified sealing compound; having the following typical physical properties:
 - (1) Basis of Design: Henry® 925 BES Sealant, or approved equal.
 - (2) Color: Varies
 - (3) Elongation: 450 - 550%.
- e. Joint Treatment Mesh:
- 1) Open weave glass fabric yarn saturated with synthetic resins, having the following typical physical properties:
 - a) Basis of Design: Henry® 183 Repair Fabric Yellow Fiberglass, or approved equal.
3. Additional Materials:
- a. Through-Wall Flashing:
 - 1) Non-vapor permeable self-adhered through-wall flashing consisting of an SBS rubberized asphalt compound integrally laminated to a yellow engineered thermoplastic film surface; having the following typical physical properties:
 - a) Basis of design: Henry® Blueskin® TWF Thru-Wall Flashing, or approved equal.
 - b) Color: Yellow
 - c) Thickness: 40 mils (1.0 mm)
 - d) Water Vapor Permeance (ASTM E96): 0.03 perms
 - e) High Temperature Stability - Flow Resistance (ASTM D5147): Pass
 - f) Low Application Temperature: 20F (-7C)
 - b. Insulation Adhesive:
 - 1) Trowel grade solvent-type, synthetic rubber-based insulation contact adhesive; having the following typical physical properties:

- a) Basis of Design: Henry® Air-Bloc® 21 Air and Vapor Barrier & Insulation Adhesive, or approved equal.
- b) Color: Cream
- c) Water Vapor Permeance (ASTM E96): 0.03 perms
- d) Maximum VOC: < 250 g/L

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:

1. Verify substrates to receive Work and surrounding adjacent surfaces are in accordance with Air / Vapor Barrier Manufacturer published literature prior to installation of self-adhered air barrier assembly.
2. Existing substrate must be continuous and secured prior to application of air barrier.
3. Sheathing panels must be securely fastened and installed flush to ensure a continuous substrate in accordance with Air Barrier Manufacturer published literature.
4. Fastener penetrations must be set flush with sheathing and fastened into solid backing.
5. Strike masonry joints full and flush.
6. Concrete surfaces shall be smooth and without large voids, spalled areas or sharp protrusions.
7. New concrete should be cured for a minimum of sixteen (16) hours after forms are removed.
8. Curing compounds or release agents used in concrete construction must be resin based without oil, wax or pigments.
9. Do not install air barrier over saturated substrates.

B. Notify General Contractor in writing of any conditions that are not acceptable.

C. The installing contractor shall examine and determine that surfaces and conditions are ready to accept the Work of this section in accordance with published literature. Commencement of Work or any parts thereof shall mean installer's acceptance of the substrate.

D. Do not apply air barrier until substrate and environmental conditions are in accordance with Air / Vapor Barrier Manufacturer's published literature.

3.02 PREPARATION

- A. All surfaces must be sound, dry, clean, and free of oil, grease, dirt, excess mortar, frost, laitance, loose and flaking particles, or other contaminants.
- B. Protect adjacent surfaces not included in scope of Work to prevent spillage and overspray.
- C. Cap and protect exposed back-up walls against wet weather conditions during and after application of membrane.
- D. Hot weather or direct-sun applications over porous substrates, such as concrete, promote rapid surface drying and can form blisters in the fluid applied membrane air barrier during curing. To aid in blister prevention prepare substrate in accordance with one of the following optional procedures:
 - 1. Prime Coat:
 - a. Apply a thin prime coat of air barrier to substrate.
 - b. Allow air barrier to fully cure prior to subsequent application.
 - c. Install air barrier to Air / Vapor Barrier Manufacturer minimum recommended mil thickness.
 - 2. Two Coat:
 - a. Apply air barrier to achieve one-half (1/2) of Air / Vapor Barrier Manufacturer minimum recommended mil thickness.
 - b. Allow air barrier to fully cure prior to subsequent application.
 - c. Apply air barrier to achieve one-half (1/2) of Air / Vapor Barrier Manufacturer minimum recommended mil thickness.
 - d. Overall dry mil thickness shall be in accordance with Air / Vapor Barrier Manufacturer published literature.

3.03 INSTALLATION

- A. Ensure substrate is ready to receive air barrier in accordance with Air / Vapor Barrier Manufacturer's published literature.
- B. Temperature limitation:
 - 1. Primary air barrier:
 - a. Substrate temperature must be above 20F (-6°C) and rising.
 - 2. Auxiliary products:
 - a. Temperature limitations may vary. Refer to Air / Vapor Barrier Manufacturer published literature.
- C. Application of Flashing:
 - 1. Self-adhered Flashing:
 - a. Where required install adhesive/primer recommended by Air / Vapor Barrier Manufacturer continuously at rate recommended ensuring complete substrate

coverage of anticipated flashing installation area.

- 1) Allow adhesive/primer to cure to a tacky film prior to application of flashing.
 - 2) Only apply adhesive/primer to surfaces which will be covered during the same working day. Primed areas not covered by end of day must be re-primed prior to installation of flashing.
- b. Measure and cut self-adhered flashing to ensure adequate length to achieve continuous coverage of desired installation.
 - c. Peel protective film from self-adhered flashing and align top of membrane verifying proper positioning prior to complete film removal and flashing placement.
 - d. Press self-adhered flashing firmly into place by applying hand pressure to the middle of the membrane and working the pressure to the edges eliminating wrinkles and air bubbles.
 - e. Install self-adhered flashings in shingle fashion to eliminate reverse laps.
 - f. Where required, prime laps at rate recommended by air barrier manufacture to ensure complete coverage of anticipated lap installation.
 - g. Lap adjoining edges a minimum of two (2) inches.
 - h. Roll flashing and laps with countertop roller to obtain thorough adhesion.
 - i. Seal end of day exposed reverse laps of self-adhered flashing with building envelope sealant.

D. Detailing/Flashing:

1. Complete detailing and flashing installations per Air / Vapor Barrier Manufacturer's published literature.
2. Refer to Air / Vapor Barrier Manufacturer guide details for further clarification and installation procedures including, but not limited to, the following:
 - a. Inside corners
 - b. Outside corners
 - c. Pipe penetrations
 - d. Shelf angles
 - e. Wall to foundation transitions
 - f. Rough openings:
 - 1) Install rough opening details per Storefront system Manufacturer's published literature and in accordance with ASTM E2112.
 - 2) Wall assemblies containing a vapor retarder on the interior wall assembly:
 - a) Extend flashing into rough opening to ensure sufficient membrane for connection with vapor retarder and provide a continuous air barrier assembly.
 - 3) Reverse laps:
 - a) Seal permanently exposed reverse laps with sealant:
 - (1) Building envelope sealant
 - (2) Liquid flashing
 - 4) Moving Joints:
 - a) Contact Air / Vapor Barrier Manufacturer.
 - 5) Transitions:
 - a) Contact Air / Vapor Barrier Manufacturer to coordinate transition of self-adhered air barrier to adjacent areas including, but not limited to,

the following:

- (1) Roof to air barrier
- (2) Air barrier to waterproofing
- (3) Fastener penetrations

E. Thru-Wall Flashing: Coordinate with Sections 04200, 07600 and 08415.

F. Application of Primary Fluid-Applied, Air and Vapor Barrier:

1. Apply air barrier in continuous, monolithic application without sags, runs, or voids, transitioning onto flashing membrane and overlapping one (1) inch, to create uniform drainage plane and air barrier.
2. Install air barrier so that subsequent membrane installation laps one (1) inch onto flashing ensuring an air and air barrier assembly.
3. Allow air barrier to fully cure prior to placement of insulation.
4. Total Dry Film Thickness (DFT):
 - a. Coverage rates may vary due to surface texture or porosity. Refer to Air / Vapor Barrier Manufacturer Technical Data Sheet for recommended coverage rates.

G. Insulation Adhesive:

1. Coordinate with Section 07200 for insulating materials.
2. Upon curing of the air barrier apply insulation adhesive in a serpentine pattern.
3. Immediately embed insulation into the adhesive and press firmly into place to ensure full contact. Apply additional adhesive if allowed to skin over.
4. Fully butter all joints of insulation panels with adhesive during installation, with the exception of expansion joints.

H. Fastener Penetrations Through Primary Air Barrier:

1. It is the responsibility of the installer penetrating the air barrier assembly to properly install fasteners and components in accordance with the Air / Vapor Barrier Manufacturer's published literature.
2. Installation requirements:
 - a. Drill fasteners and components with sufficient compression to maintain continuity in the air barrier assembly.
 - b. Refer to "Self-tapping fasteners" and/or "Pre-drilled fasteners".
3. Supplemental sealant:
 - a. Penetrations that do not meet installation requirements require the addition of sealant at point of insertion through the air barrier membrane to maintain continuity in the air barrier assembly.

4. Self-tapping fasteners:
 - a. Fastener head must be larger in diameter than the shank.
 - b. Drill fasteners perpendicular to the substrate until flush with the air barrier.
 - c. Drill fasteners to provide a continuous compression firmly against the air barrier membrane creating a gasketing seal without damaging the membrane.
 - d. Do not install fasteners through air barrier over unsupported areas of the substrate such as sheathing joints.
 - e. Overdriven fasteners, improperly installed fasteners, defective/broken fasteners, or fasteners not properly fastened into the building structure beyond the air barrier membrane should be removed and the vacated hole sealed with sealant prior to the installation of the cladding or veneer system.
5. Pre-drilled fastening assemblies:
 - a. Fastening head or assembly component must be larger in diameter than pre-drilled hole.
 - b. Fastening head or assembly component must be mounted flush with the air barrier.
 - c. Fastening head or assembly component must provide a continuous compression firmly against the air barrier creating a gasketing seal without damaging the integrity of the air barrier.
 - d. Do not install fastening components through air barrier over unsupported areas of the substrate such as sheathing joints.
 - e. Seal improperly drilled and/or vacated holes with sealant prior to the installation of the cladding or veneer system.

3.04 FIELD QUALITY CONTROL

- A. Damage to surface by other trades shall not be the responsibility of the installing Subcontractor.
- B. Final Observation and Verification:
 1. Final inspection of air barrier assembly shall be carried out by the Owner's representative, the Contractor, or Air / Vapor Barrier Manufacturer as required by warranty.
 2. Contact Air / Vapor Barrier Manufacturer for warranty issuance requirements.
- C. Air barrier assembly is not designed for permanent UV exposure. Refer to Air / Vapor Barrier Manufacturer published literature for product limitations.

3.05 CLEANING

- A. Promptly as the Work proceeds, and upon completion, clean up and remove from the premises all rubbish and surplus materials resulting from the foregoing Work.
- B. Clean soiled surfaces, spatters, and damage caused by Work of this Section.

- C. Check area to ensure cleanliness and remove debris, equipment, and excess material from the site.

END OF SECTION 07270

FVHD-5162C

2:07270-14

SECTION 07535 - REPAIRS TO MODIFIED BITUMEN ROOFING SYSTEM - COLD APPLIED

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 DESCRIPTION OF WORK

- A. The requirements of this section apply to the work specified in all roofing sections work and include also the following work:
 - 1. Roofing alterations and repair work to an existing Tremco SBS modified bitumen roofing system.
- B. Related Sections:
 - 1. Section 06100 - Carpentry for wood blocking and nailers
 - 2. Section 07500 - Roofing, General
 - 3. Section 07600 - Flashing, Sheet Metal and Roof Accessories
 - 4. Section 07800 - Roofing Specialties and Accessories
 - 5. Section 07900 - Joint Sealer Assemblies
- C. Furnish all labor, materials and incidentals required to complete roofing repair work of the 2-Ply Modified Bitumen Roof Membrane System, SBS Adhesive, flashing torch applied, insulation, thermal barrier boards, and all other re-roofing components supplied by the roofing membrane manufacturer and as shown on the drawings and/or specified herein.

1.3 QUALITY ASSURANCE

- A. Roofing and associated work must be performed by a single firm, called the "Installer" in this section, so that there will be undivided responsibility for the specified performance of all component parts.
- B. Installer: The roofing contract shall be carried out only by an installer who is franchised or otherwise accepted in writing by the roofing materials manufacturer for installation of a fully guaranteed roof in accordance with the manufacturer of the roofing membrane system requirements.
- C. Roofing Subcontractor: The roofing subcontractor shall have a minimum of five (5) years experience in the installation of the specified roofing system, with roofing projects of magnitude equivalent to the required work. Foreman employed for this project must submit evidence of having been trained by the roofing manufacturer.
 - 1. Minimum experience: Not less than five (5) years' experience with roofing projects of magnitude equivalent to the required work.

2. Maintenance Proximity: Not more than two (2) hours normal travel time from installer's maintenance plant to project site.
- D Manufacturer of Roofing Materials: Obtain primary roofing materials from a single manufacturer, who has published complete information on the required roofing system, and offers to guarantee the completed roofing installation as required. Obtain secondary materials from sources acceptable to the manufacturer of the primary roofing materials.
1. Manufacturer of Roofing System is further limited to one who will fulfill the following requirements:
 - a. Participates in a pre-roofing conference.
 - b. Shows a record of continued production of the specified materials for at least twenty (20) years.
 - c. Provides a list of executed projects in the State of New Jersey.
 - d. Provides complete manufacturer's produced printed manuals describing the roofing membrane and accessory materials, technical specifications, method of installation, including manufacturer's standard detailed drawings.
- E Inspection: Upon completion of the installation, an inspection shall be made by a technical representative of the roofing manufacturer to ascertain that the roofing system has been installed according to roofing manufacturer's latest published specifications and details.
1. There shall be no deviation made from this specification without prior written approval by the manufacturer and the Architect.
- F Insurance Certification: Assist the Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.
- G. UL Listing: Provide roofing system and component materials which have been tested for application and slopes indicated and are listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure.
1. Provide roof covering materials bearing UL Classification Marking on bundle, package or container indicating that materials have been produced under UL's Classification and Follow-up Service.
- H. FM Listing: Provide built-up roofing system and component materials which have been evaluated by Factory Mutual System for fire spread, wind-uplift, and hail damage and are listed in "Factory Mutual Approval Guide" for I-90 Wind Uplift. Roof system must be a Class 1A rate roof system.
1. Provide roof covering materials bearing FM approval marking on bundle, package or container, indicating that material has been subjected to FM's examination and follow-up inspection service.
- I. Roof Code Requirements:
1. Code Compliance: Modified Bitumen Roof Covering System shall comply with the International Building Code.

2. Roofing System Design to meet roof covering wind resistance and wind test standards as described in Section 1504 of the IBC and shall be tested in accordance FM 4474, UL 580 or UL 1897.
 - a. Basic wind speed for this project as per the IBC and must be used to determine the basic Velocity Pressure (Pv) and the building minimum design wind and wind resistance standards required by code (and comply with Table 1504.8).
3. Roofing assemblies shall meet UL for external fire exposure using UL Test No. 790 (ASTM E 108) Class A, as described in Section 1505, of the IBC.
4. Material Standards. As described in Section 1507.11.2, of the IBC. Modified Bitumen roof coverings shall comply with CGSB 37-GP-56M, ASTM D 6162, ASTM 6163, ASTM D 6164, ASTM D 6222, ASTM D 6223 ASTM 6298 and ASTM D 6509.
5. Roofing Insulation. Above-deck thermal insulation board shall comply with the standards in Table 1508.2, Polyisocyanurate board ASTM C 1289, Type I or Type II.

1.4 REFERENCE STANDARDS

- A. References in these specifications to standards, test methods, codes etc., are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.

- | | | |
|----|--------|--|
| 1. | ASTM | American Society for Testing and Materials, Philadelphia, PA |
| 2. | FM | Factory Mutual Engineering and Research, Norwood, MA |
| 3. | NRCA | National Roofing Contractors Association, Rosemont, IL |
| 4. | OSHA | Occupational Safety and Health Administration, Washington, DC |
| 5. | SMACNA | Sheet Metal and Air Conditioning Contractors National Association, Chantilly, VA |
| 6. | UL | Underwriters Laboratories, Northbrook, IL |
| 7. | IBC | International Building Code, Washington, DC |

1.5 PROJECT CONDITIONS

- A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle roofing materials in a manner which will ensure that there is no possibility of significant moisture pick-up. Store in a dry, well ventilated, weather-tight place. Unless protected from weather or other moisture sources, do not leave unused felts on the roof overnight or when roofing work is not in progress. Store rolls of felt and other sheet materials on end on pallets or other raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.

1.7 WARRANTY

A. Agreement to Maintain Roofing:

1. Provide Roofing Subcontractor's agreement to maintain the repairs to roof systems and related roof sheet metal work in a weathertight and watertight condition for a period of **two (2) years** starting from the date of approved substantial completion date and in accordance with special Maintenance Contract outlined herein.
 - a. During the Maintenance Period, the Roofing Subcontractor agrees that within 24 hours of receipt of notice from the Owner he will inspect and make immediate emergency repairs to defects or to leaks in the roof systems and related flashing work. He further agrees that within a reasonable time, he will restore the affected items to the standard of the original specifications and without voiding the Manufacturer guarantee. All emergency and permanent work during the life of the agreements to maintain the roof systems will be done without cost to the Owner, except in the event it is determined that such leaks were caused by abuse, lightning, hurricanes, tornado, hailstorm, other unusual climatic phenomena of the elements, or failure of related work (except related roof sheet metal work included under the Agreement) installed by other parties.
 - b. Agreement to maintain repairs to roofing system shall be in a written form acceptable to the Architect/Owner and before final payment is released for the project.
 - c. If, 48 hours after notification of roof leakage, Roofing Subcontractor has not responded, Owner shall have the right, without invalidating his warranties and at the expense of the Contractor, to make any emergency temporary repairs that are required in order to protect the building and its contents from damage due to roof leakage.

1.8 SUBMITTALS

- A. Submit certification that the roof system furnished is Tested and Approved by Factory Mutual as a Class 1A roof system with 1-90 Wind Uplift Requirements, or Listed by Underwriters Laboratories or Warnock Hersey for external fire tests of ASTM E - 108 Class A and the following:
 1. Evidence of Factory Mutual Approval Standard 4470 for the proposed membrane system.
 2. Underwriters' Laboratories Class A acceptance of the proposed roofing system shall include cold adhesive without additional requirements for gravel or coatings. No other testing agency approvals will be accepted.
 3. The roof configuration (including fastening of base sheet or insulation) shall be approved by FM for minimum 1-90 windstorm construction.
 4. The roof membrane configuration shall be approved by FM for Class 1-SH (severe hail) exposure.
- B. Submit product data for each type of product which is part of the roofing assembly, including sheet roofing plies, flashings, roofing boards, sheet metal work, with manufacturer's technical

product data , test data and Physical Properties and Performance. Include typical details, installation instructions, and recommendations for each type of roofing product required. Include data substantiating that materials comply with specified requirements.

- C. Shop Drawings: Submit specific roofing details illustrating relationships with adjacent construction, flashing details and roof penetrations.
 - 1. Submit shop drawings of manufactured and/or fabricated sheet metal work.
 - 2. Contract Drawing Detail Approval: If the roofing manufacturer takes exception to the contract document details, the manufacturer shall provide the roofing contractor with acceptable details to be submitted to the Professional for approval.
 - a. This Project must receive the Professional's approval through this process prior to shipment of materials to the project site.
 - b. All roofing work required by the roofing system manufacturer shall be included in the contract at no additional cost to the Using Agency.
 - c. Locations or rates of bead adhesives and mopping asphalt for securing roofing boards.

- D. Samples: Samples of each material specified, properly labeled.
 - 1. Roof membrane: For project record, submit 8- by 10-inch samples of membrane cut from rolls of each type of material used on project.
 - 2. Flashing membrane: Submit 12-inch-square samples of sheet material to be used for base flashings.
 - 3. Fasteners: Submit (2) of each type.
 - 4. Coatings and adhesives: Submit samples for each type to be used.

- E. Submit independent test data according to ASTM designation D-5147-91 "Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material" substantiating that materials comply with specified requirements.

- F. Submit evidence and description of manufacturer's quality control/quality assurance program for the primary roofing products supplied. The quality assurance program description shall include all methods of testing for physical and mechanical property values. Provide confirmation of manufacturer's certificate of analysis for reporting the tested values of the actual material being supplied for the project prior to issuance of the specified guarantee.

- G. Submit a letter from the primary roofing manufacturer confirming that proposed membrane manufacturer has been producing SBS products in the United States for a minimum of five (5) years without a change in the basic product design, physical and mechanical properties, or SBS modified bitumen blend, polymer specification, asphalt and filler formulation.
 - 1. Letter shall confirm the number of years it has directly manufactured the proposed primary roofing system under the trade name and/or trademarks as proposed.

2. Letter shall confirm that a phased roof application, with only the modified bitumen base ply in place for a period of up to 10 weeks, is acceptable and approved for this project.
 3. Letter shall include a list of five (5) of the proposed primary roofing manufacturer's projects, located in the United States, of equal size and degree of difficulty which have been performing successfully for a period of at least 5 years.
 4. Letter shall confirm that the filler content in the elastomeric blend of the proposed roof membrane and flashing components does not exceed 35% in weight.
 5. Letter shall include a complete list of material physical and mechanical properties for each sheet including: weights and thicknesses; low temperature flexibility; maximum load; elongation @ 5% maximum load (ultimate elongation); dimensional stability; high temperature stability; granule embedment and resistance to thermal shock (foil faced products).
 6. Letter shall confirm that the proposed roof membrane and flashing components meet or exceed the physical and mechanical requirements listed in Part 2 of this specification.
 7. Letter shall confirm that the proposed roof membrane system meets the requirements of ASTM D 5849 Resistance to Cyclic Joint Displacement (fatigue) at 14 F (-10C). Passing results shall show no signs of membrane cracking or interply delamination after 500 cycles in an unaged specimen and 200 cycles in a specimen after heat conditioning.
- H. Certifications: The Contractor / Installer / Manufacturer (grantor) shall submit certifications to the Architect that the contract documents including the materials, methods and details of work provided for therein, are adequate to accomplish the specified results.
1. Contractor shall provide manufacturer's "Roof Assembly Letter" confirming each proposed roof system and decking description as follows:
 - a. Assembly,
 - b. Construction Type,
 - c. Maximum Slope,
 - d. Deck Type,
 - e. Insulation - Layer (1),
 - f. Insulation Fastening,
 - g. Insulation Attachment Requirements; Field, Perimeter, Corners,
 - h. Insulation - Layer (2),
 - i. Insulation Attachment; Adhesive,
 - j. Membrane.

PART 2 - PRODUCTS

2.1 ROOFING MATERIALS

- A. Existing Roofing Manufacturer / System: Tremco Incorporated.

1. Base Ply Sheet: POWERply Standard Smooth - ASTM D 6163, Type I, Grade S, glass-fiber-reinforced, SBS-modified asphalt sheet; smooth surfaced.
2. Cap Sheet: POWERply Standard Plus FR - ASTM D 6163 Type III, Grade G.
3. Flashing Sheet: Hypalon Elastomeric Sheeting - ASTM D 5019, Type I, Grade II CSPE sheet.

2.2 ROOFING MATERIALS

- A. Existing Warranted Roofing System: All roofing system materials and components as specified herein are based upon the POWERply Standard Smooth Roofing System, as manufactured by Tremco Incorporated.
- B. Roofing Membrane Assembly: A roof membrane assembly consisting of two plies of a prefabricated, reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane, applied over a prepared substrate.
 1. Both reinforcement mats shall be impregnated/saturated and coated each side with an SBS modified bitumen blend.
 2. The roof system shall pass 500 cycles of ASTM D 5849 Resistance to Cyclic Joint Displacement (fatigue) at 14°F (-10°C.).
 3. Passing results shall show no signs of membrane cracking or interply delamination after 500 cycles.
 4. The roof system shall pass 200 cycles of ASTM D 5849 after heat conditioning performed in accordance with ASTM D 5147. The assembly shall possess waterproofing capability, such that a phased roof application, with only the modified bitumen base ply in place, can be achieved for prolonged periods of time without detriment to the watertight integrity of the entire roof system.
- C. Roofing Materials and Accessories:
 1. Modified Membrane Sheets: Manufacturer's standard and as following:
 - a. **"POWERply Standard Smooth"; Roofing Membrane Sheet:**
 - 1) Thickness (min): 0.080 inch (ASTM D 5147).
 - 2) Tensile Strength at 73°F (23°C) minimum (ASTM D 5147); machine direction: 80 lbf/in (14.0 kN/m); cross machine direction: 80 lbf/in (14.0 kN/m).
 - 3) Tear Strength at 73°F (23°C) Minimum (ASTM D 1547); machine direction: 100 lbf (440 N); cross machine direction: 90 lbf (440 N).
 - 4) Elongation at 73°F (23°C) minimum (ASTM D 5147); machine direction: 3.0%; cross machine direction: 3.0%.
 - b. **"POWERply Standard Plus HT FR"; Roofing Membrane Cap Sheet:**
 - 1) Exterior Fire-Test Exposure: (ASTM E 108), Class A.
 - 2) Tensile Strength at 73°F (23°C) minimum (ASTM D 5147); machine direction: 160 lbf/in (28.0 kN/m); cross machine direction: 160 lbf/in (28.0 kN/m).

- 3) Tear Strength at 73 °F (23 °C) Minimum (ASTM D 1547); machine direction: 290 lbf (1280 N); cross machine direction: 250 lbf (1100 N).
 - 4) Elongation at 73 °F (23 °C) minimum (ASTM D 5147); machine direction: 6.0%; cross machine direction: 6.0%.
 - 5) Low Temperature Flex, maximum (ASTM D 5147); -25 °F (-31 °C).
 - 6) Thickness, minimum (ASTM D 5147); 0.130 inch (3.3 mm).
 - c. **Flashing Sheets: "Hypalon Elastomeric Sheeting":**
 - 1) Breaking Strength, minimum (ASTM D 751); 225 lbf (1000N).
 - 2) Tear Resistance: (ASTM D 751); 90 lbf (400 N).
 - 3) Elongation at Fabric Break, minimum (ASTM D 751); 25%.
 - 4) Low Temperature Flexibility: (ASTM D 2136); -40 °F (-40 °C).
 - 5) Thickness, minimum (ASTM D 751); 0.040 inch (1.0 mm).
 - 6) Color: **White**.
 - d. Burmesh: Woven glass-fiber cloth, treated with asphalt, complying with ASTM D 1668, Type I.
2. Membrane Cold Adhesive: An asphalt, solvent blend conforming to ASTM D 4479, Type II requirements.
 - a. As recommended by the roofing manufacturer.
 3. Insulation Adhesive: Solvent-free, cold fluid-applied, bituminous-urtheane adhesive formulated to adhere roof insulation to substrate.
 - a. Tremco: Fas-n-Free Adhesive
 4. Ply Sheet Adhesive: One-part, asbestos-free, cold applied adhesive specially formulated for compatibility and use with specified roofing membranes and flashings.
 - a. Tremco, Powerply Standard Cold Adhesive.
 5. Cap Sheet Adhesive: One-part, asbestos-free, cold applied adhesive specially formulated for compatibility and use with specified roofing membranes and flashings.
 - a. Tremco, Powerply Standard Cold Adhesive.
 6. Elastomeric Flashing Adhesive: One-part, asbestos-free, cold applied, SEBS/SIS, elastomeric trowel-grade adhesive, specially formulated for compatibility and use with specified roofing membranes and flashings.
 - a. Tremco, Sheeting Bond Black.
 7. Water-Based Asphalt Primer: Water-based, polymer modified, asphalt primer.
 - a. Tremco, Tremprime WB.
 8. Asphalt Roofing Mastic: One-part, asbestos-free, cold-applied mastic specially formulated for compatibility and use with specified roofing membranes and flashings.
 - a. Tremco, ELS.
 9. Rigid Roofing Boards: Types which provided or approved by the roofing system manufacturer which include but are not limited to the following
 - a. ROOF INSULATION BOARD: Provide polyisocyanurate board for Uniform and Tapered Insulation:

- 1) Board Size: 4' x 4' only.
 - 2) Thickness (Uniform): As necessary to achieve the required "R" value. See also minimum thickness indicated on drawings and tapered areas.
 - a) Bottom layers on existing flat metal / concrete / wood decking shall be a minimum of 3½" thick, two layers of 1½" thick with staggered joints plus ½" minimum of tapered insulation at the low point, as indicated.
 - (1) Tapered insulation; 1/4" to the foot slope for the roof area; and ½" to the foot slope for gussets/crickets. Stagger all joints between layers.
 - 3) R-Value (Uniform): Match thickness of adjacent existing insulation to remain.
 - 4) Compressive Strength: 25 psi, minimum, Grade 3.
 - 5) Density: 1.5 pcf.
 - 6) Surface - Burning Characteristics: Tested in accordance with ASTM E 84;
 - a) Flame Spread: Not more than 25
 - b) Smoke - developed: Not more than 200
 - 7) FM approved for Wind Uplift, tested for 60 and 90 psf.
 - b. Top Over laying Board:
 - 1) THERMAL BARRIER BOARD
 - a) Basis of Design: "Securerock Gypsum-Fiber" Roof Board as manufactured by USG; or approved equal.
 - (1) Water-resistant gypsum substrate core board, UL 790 Class A listing as a barrier board, and tested in accordance with ASTM E-84;
 - (a) Flame Spread: 0
 - (b) Smoke developed: 0
 - (2) Board Size: 4' x 4'.
 - (3) Thickness (Uniform): 1/2", R-Value per ASTM C518 = R.5.
 - (4) FM approved for Wind Uplift, tested for 60 and 90 psf.
 - (5) Stagger all joints with bottom layer.
 - c. Adhesive for Top Over Laying Boards: Insta-Stik ; Flexible Products Company, or approved equal.
10. Vapor Retarded: SBS modified, asphalt-coated, fiberflax/fiberglass/polyester reinforced sheet dusted with fine mineral surfacing on both sides which meets the requirements of ASTM D 4601, Type II.
 - a. Tremco, BURmastic Composite Ply HT.
11. Taper Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
12. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
13. Walktread: "Tremco, Trem-Tred": Mineral-granule-surfaced, reinforced asphaltic composition, slip-resisting pads, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer.
 - a. Thickness: 1/2-inch (13 mm)
 - b. Flexural Strength at maximum load, minimum, (ASTM C 203), 218 psi (1.5 kPa).
 - c. Granule adhesion (weight loss), maximum (ASTM D 4977), 1.1 gram
 - d. Impact Resistance at 77°F (25 °C), (ASTM D 3946), No damage to roof.
 - e. Pad Size: 3' x 4' x ½".

14. Wood Blocking & Curbs: Lumber; #2 grade free from warping and visible decay; fire retardant treated (FRT) to meet AWPA C20 (lumber), and marked and in accordance with requirements indicated in section 06100.
15. Mechanical Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
16. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than 28 gauge and not less than 1-inch in diameter. Discs shall be formed to prevent dishing. Bell or cup-shaped caps are not acceptable.

PART 3 - EXECUTION

3.1 INSPECTION EXISTING SUBSTRATE

- A. Immediately after limited removal of existing roofing materials to facilitate installation of new work and exposing existing decking, the Contractor shall schedule on-site field visit with manufacturer's representatives to determine suitability of existing decking. Contractor shall notify the Professional for the date and time of the field visit.
 1. Correct, repair and patch any damage and/or defects to existing roof decking prior to start of installation of new roofing system.

3.2 PREPARATION OF SUBSTRATES

- A. Roof substrate shall be dry and free of foreign materials. Remove nails, nail heads and other protrusions from existing deck.
 1. Roof substrate shall be free of ponded water, ice, or snow to eliminate future condensation problems.
 2. Preparations, repair and patching of existing roof decking shall be completed prior to start of any new roofing / flashing work.

3.3 INSTALLATION - GENERAL REQUIREMENTS

- A. Install roofing system in accordance with manufacturer's recommendations.
- B. Install FRT wood cants, blocking, curbs and nailers in accordance with requirements of Section 06100 - Carpentry.
- C. Install roofing membrane, base flashing, wood cants, blocking, curbs, nailers and component materials in compliance with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system as listed in FMG's "Approval Guide" for fire/windstorm classification indicated. Comply with recommendations in FMG Loss Prevention Data Sheet 1-49, including requirements for wood nailers and cants.

- D. Install roofing system in accordance with the following NRCA Manual Plates and NRCA recommendations; modify as required to comply with requirements of FMG references above:
1. Base and Surface-mounted Counterflashing: Plates MB-4 and MB-4S.
 2. Curb Detail at Rooftop HVAC Units, Job Built, Wood: Plates MB-13 and MB-13S.
 3. Penetration, Structural Member: Plates MB-15 and MB-15S.
 4. Penetration, Sheet Metal Enclosure: Plates MB-16 and MB-16S.
 5. Penetration, Stack Flashing: Plates MB-17 and MB-17S.
 6. Penetration, Pocket: Plates MB-19 and MB-19S.
- E. Comply with instructions of the primary roofing materials manufacturer, and comply with the requirements of the existing (20) Years Total Roofing System Warranty as indicated on the documents included following this Section.
- F. Performance: It is required that roofing work be water-tight for normal weather exposure and not deteriorate in excess of normal weathering.
- G. Clean site of all debris and contractor materials; restore damaged site work, (i.e.; shrubs, turf, curbs, etc.) to conditions prior to start of this work.
- H. Insulation Under Roofing: Do not install roofing or new insulation over wet insulation; remove and replace with dry insulation before proceeding.
- I. Coordinate Roofing with flashing and new rooftop unit work to ensure proper sequencing of entire work.
- J. Cooperate with inspection and test agencies engaged or required to perform services in connection with roofing system installation.
- K. Protect work from spillage of roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace/restore other work damaged by installation of roofing system work.
- L. Insurance/Code Compliance: Install roofing system for (and test where required to show) compliance with governing regulations.
- M. Coordinate the installation of insulation, roofing sheets, flashings, stripping, coatings and surfacing, so that insulation and felts are not exposed to precipitation nor exposed overnight. Provide cut-offs at end of each day's work, to cover exposed felts and insulation with a course of coated felt with joints and edges sealed with roofing cement. Remove cut-offs immediately before resuming work. Glaze coat installed ply-sheet courses at end of each day's work where final surfacing has not been installed.

- N. Substrate Joint Penetrations: Do not allow adhesive to penetrate substrate joints and enter building or damage insulation or other construction.

3.4 PROTECTION

- A. Contractor shall provide protection for roofing during construction period, so that the work will be without damage or deterioration except for normal weathering at time of acceptance.

3.5 INSTALLATION OF THE INSULATION / ROOFING BOARDS

- A. Each 4'x4' insulation board of the base layer of insulation must be mechanically fastened to the roof deck with at least one (1) fastener every two (2) square feet. Fastening pattern may be reduced by Factory Mutual, the insulation manufacturer, and the roofing materials' manufacturer.
- B. Secure subsequent layers and the top cover board to bottom insulation layers using manufacturer's approved adhesive as indicated.
 - 1. Insulation boards will have joints staggered. Gaps between panels of insulation will not exceed 1/4" at wood blocking and joints in the field of insulation will be tight. Panels with broken corners, damaged faces or wet panels of insulation will not be used. Where joints in field in insulation are not tight, joints will be taped with six (6) inch fiberglass tape adhered to insulation in approved adhesive.
- C. Install top laying thermal board in cold adhesive and in accordance with manufacturers' requirements. Stagger all joints with bottom insulation layer.
- D. Install only that amount of insulation that can be covered the same day with new roof system. No phased roofing will be accepted unless pre-approved by the roofing manufacturer.

3.6 WATER CUT-OFF

- A. At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

3.7 GRANULE EMBEDMENT

- A. Broadcast mineral granules over all bitumen overruns on the finish ply surface, while the bitumen is still hot or the adhesive is soft, to ensure a monolithic surface color.

3.8 WALKTREAD

- A. Cut the walktread into maximum 5 foot lengths and allow to relax until flat. Adhere the sheet using the specified plastic cement. Apply the specified cement in a 3/8 inch thickness to the back of the product in 5 inch by 5 inch spots in accordance with the pattern as supplied by the walktread manufacturer. Walk-in each sheet after application to ensure proper adhesion. Use a minimum spacing of 2 inches between sheets to allow for proper drainage.

3.9 PIPING, PITCH POCKETS AND VENT PIPING

- A. Follow manufacturer's standard details and printed instructions for installation of membrane sheet and flashing around piping, pitch pockets and vent piping.

3.10 FIELD QUALITY CONTROL AND INSPECTIONS

- A. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.
- B. Notification of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.
- C. Final Inspection
 - 1. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.
- D. Issuance of the Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

END OF SECTION 07535

WARRANTY NUMBER: 132303
OWNER: Clearview Regional School District
ADDRESS: 420 Cedar Road, Mullica Hill, NJ 08062
BUILDING DESCRIPTION: Clearview Regional Middle School Roofs 1-6
ADDRESS: 595 Jefferson Road, Mullica Hill, NJ 08062
ROOF AREA: 53,000 sq. ft.
DATE OF JOB COMPLETION: September 7, 2009
INSTALLATION PRICE: \$1,034,310.00
ROOFING SYSTEM: Replacement: POWERply Standard FR
INSTALLATION CONTRACTOR: Alper Enterprises Inc.
ADDRESS: 530 Kings Highway, Moorestown, NJ 08057

Tremco Incorporated (hereinafter "Tremco") hereby warrants to the above-named Owner that, subject to the terms, conditions, and limitations stated herein, it will repair leaks and provide the following services to the Owner on the roofing system on the building (hereinafter "TRS") for a period of twenty (20) years from the date of job completion. TRS shall be defined as the weatherproofing assembly and its components, which includes the following: membrane, insulation, flashings, all sheet metal-related details, and termination details as specified by Tremco. The services being offered by Tremco include the following:

A. INSPECTIONS, HOUSEKEEPING AND PREVENTIVE MAINTENANCE

In year two (2), year five (5), year ten (10), and year fifteen (15) of this warranty, Tremco shall provide roof inspections, preventive maintenance, and limited housekeeping services, except as excluded in Section C and Section D, on the TRS. (If a TremCare Service Agreement has been purchased for the TRS in addition to this warranty, these inspections and the related reporting will be carried out as part of the TremCare Service Agreement. The warranty and the TremCare Service Agreement will remain in effect for the warranty period simultaneously.)

Roof inspection services shall include the following:

1. Visual inspection of the roof membrane and roof surface conditions.
2. Inspection of the flashing systems including, but not limited to, the metal edge system, base flashings on equipment and adjoining walls, counterflashings and termination details, soil stacks and vents, and inspection of rooftop projections, and equipment including, but not limited to, pitch pans, HVAC equipment, sky lights, and access hatches.

Roof inspection services do not include:

1. Inspection for water damage or mold growth.
2. Detection or identification of mold.

Preventive maintenance services shall include the following:

1. Metal edge flashing components - tears, splits, and breaks in the membrane flashings will be repaired with appropriate repair mastics and membranes.
2. Tears and splits in the flashing membrane will be repaired with appropriate repair mastics and membranes. Open split flashing strip-ins will be repaired with appropriate repair mastics and membranes. Exposed fasteners will be sealed. Termination bar and counterflashings will be sealed.
3. Roof membrane maintenance repairs - tears, breaks, and splits in the roof membrane will be repaired with appropriate repair mastics and membranes. Splits and blisters which threaten the roof integrity will be cleaned, primed, and repaired with appropriate repair mastics and membranes. Metal projections (hoods and clamps) will be sealed. This warranty does not include recoating of roof membranes.

Preventive maintenance services do not include:

1. Repairs or maintenance of any building component other than the TRS.
2. Remediation or abatement of mold.

General rooftop housekeeping services shall include the following: Removal of incidental debris. All debris will be disposed of at the Owner's approved on-site location.



B. ROOF INSPECTION REPORTS

Tremco will provide roof inspection reports to the Owner based upon the inspections as defined in paragraph A. The reports shall become part of the roof database maintained on the Tremco TRS. Tremco will be excused from performing under this warranty if prevented or delayed by events not within its control, including events such as floods, fires, accidents, riots, explosions, governmental order, acts or omissions of contractors or other third parties, inability to access the TRS, etc. Roof inspection reports will not address the presence of water damage to any building components other than the TRS or the presence of mold.

C. OWNER'S RESPONSIBILITIES

It is agreed by the parties that Tremco, by this warranty, does not assume possession or control of any part of the TRS. Control and ownership of the TRS and all parts of the building remains solely with the Owner. The Owner is solely responsible for all requirements imposed by any federal, state or local law, ordinance or regulation, and all repair, maintenance, and other work with respect to the TRS and the building, except as expressly stated by this warranty.

Housekeeping and general roof top preventive maintenance does not eliminate or replace the building Owner's responsibility for keeping effluent and debris from the roof surface. Customer production-related materials are excluded as part of the housekeeping services. If scheduled cleaning is insufficient to maintain the roof integrity, Owner must pay for additional cleaning/inspections or assume responsibility for such cleanings. Owner agrees that all debris on or removed from the roof is the sole property of Owner, and it is the sole responsibility of Owner to properly dispose of said debris.

The Owner shall, at all times, exercise reasonable care in the use and maintenance of the TRS.

In order to protect the investment this TRS represents, the building Owner must fulfill his responsibilities as outlined in the attached Owner's Manual. Lack of care and maintenance can have significantly damaging effects on the system's overall performance and is cause for cancellation of this warranty.

Care and maintenance guidelines include, but are not limited to:

- ➔ Regular ongoing inspection by the Owner - This will allow for implementation of good housekeeping practices and early detection of problems such as any physical damage.
- ➔ Verification that no alterations or unauthorized repairs have been made to the roofing system.

If alterations are being considered, the Owner must notify Tremco in order for the proper authorized follow-up to be completed.

The Owner shall report all leaks which occur in the TRS within the warranty period by contacting Tremco at 1-800-422-1195 and in writing to Tremco Incorporated at 3735 Green Road, Beachwood, Ohio 44122, as soon as possible (however, in no event more than thirty (30) days) after leakage is or should have been discovered. Immediate repair of leaks is critical to prevent water damage and mold growth. In no event is Tremco responsible for any repairs to any part of the building other than the TRS. The liability or expense for such repair is to be assumed and paid by the Owner. If the leak is not within the coverage of this warranty, Tremco shall advise the Owner, and the Owner shall have repairs performed within thirty (30) days according to Tremco specifications by a Tremco certified or approved applicator. The Owner agrees to provide Tremco with unrestricted ready access to the TRS and all areas of the building on which the TRS is located.

D. WARRANTY EXCLUSIONS

This warranty does not cover any leaks or damage or failure of the TRS or any part thereof as a result of:

1. Natural or accidental disasters including, but not limited to, damage caused by lightning, hailstorms, floods, hurricane force winds (74 mph or greater), tornadoes, earthquakes, fire, vandalism, animals, penetration of the membrane, or chemical attack by outside agents.
2. Use of materials not specified by Tremco or unauthorized repairs to the TRS.
3. Any intentional or negligent act on the part of the Owner or any third party including, but not limited to, misuse, traffic, storage of or discharge of materials or effluent on the roof. Any repair of these items will be at Owner's expense.
4. Distortion, expansion or contraction of the TRS caused by faulty original construction or design of building components including parapet walls, copings, chimneys, skylights, vents or roof deck, or lack of positive, proper, or adequate drainage resulting in ponding water on the roof.

E. WARRANTY LIMITATIONS

Tremco shall have no responsibility and or liability under this warranty until all bills for installation, supplies, and services sold in connection with the TRS have been paid in full.

The Owner's rights under this warranty are specific to the Owner and are not transferrable.

Tremco's obligations under this warranty may be voided by Tremco based on any of the events described in Section D, change in usage of the building without the prior written approval of Tremco, repairs, alterations, penetrations of or attachments to the TRS without the prior written approval of Tremco, building settlement, deterioration, cracking or failure of the roof deck, coping and parapet walls, infiltration or condensation of moisture in, through or around walls, copings, underlying structure, hardware or equipment, or failure of the Owner to comply with its obligations described in this warranty.

F. OTHER TERMS

THIS WARRANTY IS IN LIEU OF ANY AND ALL OTHER WARRANTIES, OBLIGATIONS OR AGREEMENTS, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, AND ANY RIGHTS OR REMEDIES AGAINST ANY PERSON OR ENTITY UNDER THE UNIFORM COMMERCIAL CODE OR OTHERWISE WITH RESPECT TO THE SALE OF GOODS AND/OR SERVICES. THE REMEDIES AND OBLIGATIONS STATED IN THIS WARRANTY ARE THE SOLE AND EXCLUSIVE REMEDIES OF AND OBLIGATIONS TO THE OWNER FOR ANY AND ALL MATTERS ARISING WITH RESPECT TO OR IN ANY WAY CONNECTED WITH THE TRS, OR ITS COMPONENT PRODUCTS, OR ANY GOODS OR SERVICES RELATED THERETO, REGARDLESS OF THE SOURCE OR PROVIDER OF SUCH GOODS OR SERVICES. THE OWNER SHALL PROVIDE WAIVERS OF SUBROGATION UPON REQUEST. NO REPRESENTATIVE OF TREMCO INCORPORATED, OR ANY EMPLOYEE, AGENT OR AFFILIATED COMPANY ("AFFILIATE") HAS AUTHORITY TO VARY OR ALTER THESE TERMS. IN NO EVENT SHALL TREMCO INCORPORATED OR ANY AFFILIATE BE LIABLE FOR ANY DAMAGE TO THE BUILDING ITSELF (OTHER THAN THE TRS), THE CONTENTS OF THE BUILDING, OR ANY OTHER SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES. THE TOTAL LIABILITY OF TREMCO INCORPORATED, AND ANY AFFILIATE OVER THE LIFE OF THE WARRANTY, SHALL BE PRO-RATED ON A STRAIGHT LINE BASIS, AND TREMCO'S LIABILITY SHALL NOT EXCEED SUCH PRO-RATED AMOUNT. NEITHER TREMCO INCORPORATED OR ANY AFFILIATE SHALL BE LIABLE FOR ANY DAMAGES WHICH ARE BASED UPON NEGLIGENCE, BREACH OF WARRANTY, STRICT LIABILITY OR ANY OTHER THEORY OF LIABILITY OTHER THAN THE EXCLUSIVE LIABILITY SET FORTH IN THIS WARRANTY.

The Owner agrees that this warranty, and the services and remedies set forth herein, are exclusive, and there are no other warranties between the Owner and Tremco or any affiliate. Any unresolved issues under this warranty shall be submitted to the exclusive jurisdiction of the courts of Cuyahoga County, Ohio, and governed by Ohio law.

TREMCO INCORPORATED
ROOFING & BUILDING MAINTENANCE DIVISION

By: *Julie G. Gaborowski*

Title: Warranty Administrator

Date: November 5, 2009

SECTION 07840 - THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
 - 1. Walls and partitions.
 - 2. Smoke barriers.
 - 3. Construction enclosing compartmentalized areas.
- B. Related Sections include the following:
 - 1. Section 07200 - Building Insulation, for safing insulation and accessories.
 - 2. Division 7 Section "Sprayed Fire-Resistive Materials."
 - 3. Division 22 and 23 Sections specifying duct and piping penetrations and firestop systems to be performed by the Plumbing and HVAC work Subcontractors.
 - 5. Division 26 Sections specifying cable and conduit penetrations and firestop systems to be performed by the Electrical Subcontractor.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
 - 1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
 - 2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
- B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

- C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
1. Penetrations located outside wall cavities.
 2. Penetrations located outside fire-resistive shaft enclosures.
 3. Penetrations located in construction containing fire-protection-rated openings.
 4. Penetrating items larger than 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.
- D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
1. For piping penetrations for plumbing systems, provide moisture-resistant through-penetration firestop systems.
 2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- E. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. Product Data: For each type of through-penetration firestop system product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architect and Owner, and other information specified.

- D. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.
- E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed through-penetration firestop systems similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Installer Qualifications: An experienced installer who is qualified by having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
 - 1) UL in "Fire Resistance Directory."
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi component materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Notify Contractor's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Contractor's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 PRODUCTS / MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application in the Through-Penetration Firestop System Schedule at the end of Part 3 and as shown on drawings and as produced by one of the following manufacturers:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hilti Construction Chemicals, Inc.
 - 2. Isolatek International.
 - 3. Nelson Firestop Products.
 - 4. 3M Fire Protection Products.
 - 5. Or approved equal.

2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.

2.3 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

- I. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- J. Silicone Foams: Multi component, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
 - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.4 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems.

Remove loose particles remaining from cleaning operation.

- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: The Contractor will engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports.
 - 1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.
- B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.
- C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.5 IDENTIFICATION

- A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
1. The words: "Warning–Through-Penetration Firestop System–Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Through-penetration firestop system manufacturer's name.
 6. Installer's name.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

3.7 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to the alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.
1. Firestop Systems with No Penetrating Items: Comply with the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Mortar.

END OF SECTION 07840

SECTION 07900 - JOINT SEALER ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Part 1 through Part 6 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes joint sealant assemblies for the following applications which include performances of materials, installation requirements, as indicated herein in this specification and as specified by cross references in other Parts 1 through 6 specification sections.
- B. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
 - 1. Control and expansion joints in unit masonry.
 - 2. Joints between different materials.
 - 3. Perimeter joints between materials listed above and frames of doors, as applicable.
 - 4. Other joints, as indicated.
- C. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - 1. Control and expansion joints on exposed interior surfaces of exterior walls.
 - 2. Perimeter joints of exterior openings, where indicated.
 - 3. Vertical control joints on exposed surfaces of interior unit masonry walls and partitions.
 - a. Perimeter joints between interior wall surfaces and frames of interior doors, and storefront systems.
 - b. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - c. Other joints, as indicated.
 - 4. Interior joints in the following horizontal traffic surfaces:
 - a. Control and expansion joints in cast-in-place concrete slabs.
 - b. Other joints, as indicated.
- D. Preparation of all joints to be sealed.
- E. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:
 - 1. Cutting out as needed to give proper depth.
 - 2. Installation of proper back up material for each joint.
 - 3. Cleaning to remove all dust, dirt, oil films, loose material etc.
 - 4. Masking of adjacent surfaces.
 - 5. Priming of joint surfaces.

1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Where fire rated joint assemblies are indicated, provide materials and construction which are identical to those of assemblies whose fire endurance has been determined by testing in compliance with the following requirements, tested by a recognized testing and inspecting organization or by another means, as acceptable to authority having jurisdiction.
1. Fire Testing: ASTM E 119/UL 263.
 2. Surface Burning Characteristics: ASTM E84/UL 723.
 - a. Flame Spread: 15
 - b. Smoke Developed: 0
 3. Through - Penetration Firestopping: ASTM E814/UL 1479.
 4. Fire Resistance of Building Joint Systems: UL 2079
- B. VOC Content of Interior Sealants and Sealant Primers: Comply with the following limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Sealants: Not more than 250 g/L.
 2. Sealant Primers for Nonporous Substrates: Not more than 250 g/L.
 3. Sealant Primers for Porous Substrates: Not more than 775 g/L.
- C. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
1. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
 2. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - a. Use manufacturers standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - b. Testing will not be required if joint sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
 - c. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates as follows:
 - (1) Locate test joints where indicated or, if not indicated, as directed by Architect.
 - (2) Conduct field tests for each application indicated below:
 - (a) Each type of elastomeric sealant and joint substrate indicated.
 - (b) Each type of nonelastomeric sealant and joint substrate indicated.

- (3) Notify Architect seven days in advance of dates and times when test joints will be erected.
 - (4) Sealant Manufacturer Responsibility:
 - (a) Manufacturer shall provide Technical Representative to perform Sealant Joint Field Pull Test. Manufacturer Sales representative is not acceptable to perform Field Pull Test.
 - (b) Technical Representative performing Field Pull Test must be an employee of the Sealant Manufacturer. Outside Sales Agent or Contract Technical Representative is not acceptable to perform Field Pull Test.
 - (5) Test Method: Test joint sealants by hand-pull method described below:
 - (a) Install joint sealants in 60-inch long joints using same materials and methods for joint preparation and joint-sealant installation required for the completed Work. Allow sealants to cure fully before testing.
 - (b) Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2-inch piece.
 - (c) Use fingers to grasp 2-inch piece of sealant between cross-cut end and 1-inch mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
 - (d) For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.
 - (6) Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 - (7) Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
3. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:
- a. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
 - b. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
4. PROJECT CONDITIONS
- a. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
 - (1) When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
 - (2) When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40°F.
 - (3) When joint substrates are wet.

- b. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- c. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

D. Special Project Warrantee and Guarantee:

- 1. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - a. Warranty Period: **Five (5) years** from approved date of Substantial Completion.
- 2. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - a. Warranty Period: **Five (5) years** from approved date of Substantial Completion.
- 3. Guarantee shall further state that all exterior sealant will be guaranteed against:
 - a. Adhesive or cohesive failure in joints where movement is under maximum 25% extension or compression.
 - b. Any crazing greater than 3 mils in depth developing on surface of material.

1.4 SUBMITTALS

- A. Product Data from manufacturers for each joint sealer product required, including instructions for joint preparation and joint sealer application, include color samples showing full range of colors available, for each product exposed to view.
 - 1. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- B. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturers.
 2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40°F (4.4°C).
 3. When joint substrates are wet due to rain, frost, condensation, or other causes.
- B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less than allowed by joint sealer manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealers indicated or, if not otherwise indicated, as selected by Architect from manufacturer's available full range of standard and optional colors.
- C. Grade of Sealant: For each application, provide the grade of sealant (nonsag, self-leveling, no track, knife grade, etc.) as recommended by the manufacturer for the particular condition of installation (location, joint shape, ambient temperature, and similar conditions) to achieve the best possible overall performance. Grades specified herein are for normal condition of installation.

2.2 MISCELLANEOUS MATERIALS

- A. Joint Primer/Sealer: Provide the type of joint primer/sealer recommended by the sealant manufacturer of the joint surfaces to be primed or sealed.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
- C. Sealant Backer Rod: Provide materials which are in compliance with ASTM D 1056; compressible rod stock of polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer.
1. Materials shall be capable of remaining resilient at temperatures down to minus 26°F.

D. Joint Fillers:

1. Joint Fillers for Interior Concrete Slabs: Provide "Ceramar" flexible foam expansion joint, as manufactured by W.R. Meadows, Inc.; or approved equal.
 - a. Flexible foam expansion joint filler composed of a unique synthetic foam of isomeric polymers in a very small, closed-cell structure. Gray in color, Ceramar is a lightweight, flexible, highly resilient material offering recovery qualities of over 99%. The compact, closed-cell structure will absorb almost no water.
 - b. Non-impregnated and will not stain or bleed.
 - c. Non-gassing.
 - a. Complies with:
 - (1) ASTM D 5249, Type 2,
 - (2) ASTM D 1752, Sections 5.1 - 5.4, with compression requirement modified to 10 psi minimum and 25 psi maximum,
 - (3) ASTM D 7174-05.

2.3 SEALANTS

- A. **Sealant Type 1:** For all control and expansion joints in concrete sidewalks and slabs on grade, two-part, self leveling polyurethane traffic grade sealant, complying with, and ASTM C 920 and ASTM D 1850.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "NR-200 Urexpan"; Pecora Corporation.
 - b. "THC 900/901"; Tremco, an RPM Co.
 - c. "Sikaflex-2c SL"; Sika Corporation.
 - d. Or approved equal.
2. Color to be selected by the Architect.

- B. **Sealant Type 4:** For all joints at plumbing fixtures, provide one-part, neutral-curing, silicone rubber sanitary sealant, complying with ASTM C920; and containing fungicide for mildew resistance recommended by manufacturer for use at joints for plumbing fixtures; tub and shower, sinks countertops, appliances, etc.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "898 Silicone"; Pecora Corporation.
 - b. "Tremsil 200"; Tremco, an RPM Co.
 - c. "786 Mildew Resistant"; Dow Corning.
 - d. "Sikasil N-Plus"; Sika Corporation.
 - e. Or approved equal.

- C. **Sealant Type 6: Hybrid Sealants (Silyl-Terminated Polyether (STPE) Joint Sealants**

1. **STPE, S, NS, 50, NT:** Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 - a. Uses: Interior and exterior horizontal and vertical joints of door and window perimeters, expansion and control joints, coping and coping to facade joints, EIFS and architectural panels, fiber cement panels, etc.
 - b. Products: Subject to compliance with requirements, provide one of the following:

- 1) "DynaTrol® I-XL Hybrid" as manufactured by Pecora Corporation. Available in ten (10) colors.
- 2) "DynaTrol® I-XL Hybrid FTH" as manufactured by Pecora Corporation. Field tintable, available in fifty (50) colors.
- 3) Equivalent by Tremco, an RPM Co.
- 4) Equivalent by Sika.
- 5) Equivalent by Dow Corning.
- 6) Or approved equal.

2.4 FIRE RATED JOINTS

- A. Construction fire rated joint assemblies shall meet indicated fire rating performance requirements. Provide assemblies where required and as indicated on the drawings with the following components:
 1. Joint Filler: Subject to compliance with indicated requirements, provide one of the following:
 - a. "Ultra Block", as manufactured by Backer Rod Manufacturing,
 - b. "Cerablanket"; Tremco,
 - c. ThermaFiber
 - d. Or approved equal.
 - e. Provide fire rated joint filler in thickness and shape as required to fill joints.
 2. Joint Sealant: Subject to compliance with requirements, provide one of the following:
 - a. "Dynatrol II"; Pecora Corporation.
 - b. "Tremstop Acrylic"; Tremco, Inc, or "Trimstop IA, Intumescent Acrylic, Tremco, Inc.
 - c. "Sikaflex-2c NS"; Sika Corporation.
 - d. Equivalent by Dow Corning.
 - e. Or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealers, with Installer present, compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer-performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
- B. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellants; water; surface dirt; and frost.

- C. Clean concrete, masonry, unglazed surfaces and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
- D. Clean metal, glass, porcelain enamel, glazed surfaces; and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.
- E. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
- F. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- G. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of joint fillers.
 - 2. Do not stretch, twist, puncture, or tear joint fillers.
 - 3. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.
- H. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.
- I. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.
- J. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

3.3 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

END OF SECTION 07900

SECTION 08110 - HOLLOW METALWORK

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 DESCRIPTION OF WORK

- A. Extent of hollow metalwork for frames and borrow lites is indicated and scheduled on drawings.
- B. Related Sections:
 - 1. Section 04200 - Masonry Work.
 - 2. Section 07900 - Joint Sealer Assemblies.
 - 3. Section 08211 - Wood Doors.
 - 4. Section 08700 - Finish Hardware.
 - 5. Section 08800 - Glass & Glazing.
 - 6. Section 09250 - Gypsum Drywall
 - 7. Section 09900 - Painting.

1.3 QUALITY ASSURANCE

- A. Provide frames complying with the following:
 - 1. Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.
 - 2. American National Standard Institute:
 - a. ANSI Standards A156 Series for Hardware.
 - b. ANSI A115 Steel Door Preparation Standards.
- B. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated or required, provide fire-rated frame assemblies that have been tested, listed, and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction, (i.e., UL, Warnock Hersey).

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements.
- B. Shop Drawings: Submit for fabrication and installation of steel frames. Include details of each frame type, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

1. Provide schedule of frames using same reference numbers for details and openings as those on contract drawings.
- C. Samples: Full range of color samples for Architect selection; 2 samples, 6" square min., of each color and texture as selected for factory-finished frames.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Before shipping, label each frame with metal or plastic tags to show its location, size, door swing, and other pertinent information. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage.
- B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store frames at building site under cover. Place units on minimum 4" high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering steel frames which may be incorporated in the work include; but are not limited to, the following:
 1. Steelcraft, a Division of Allegion.
 2. Republic Doors and Frames, a Division of Allegion.
 3. Ceco Door Products, a Division of Assa Abloy.
 4. Curries Company, a Division of Assa Abloy.
 5. Or approved equal.
- B. **Substitutions: Substitution of products will only be considered when the Contractor / Door Supplier have submitted, to the Architect, all appropriate documents and in the time frame as outlined in the requirements indicated in AIA A201 and Section 00800.**

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.
- B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A1008 and ASTM A 568.
- C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, with ASTM A 525, G60 zinc coating, mill phosphatized.
- D. Supports and Anchors: Fabricate of not less than 18-gauge galvanized sheet steel.

- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.
- F. Shop Applied Paint:
 - 1. Primer: Rust-inhibitive enamel or paint, either air-drying or baking, capable of passing a 100 hours salt spray and 250 hours humidity test in accordance with ASTM test methods B 117 and D 3322 and shall be suitable as a base for specified finish paints indicated in specification section 09900.

2.3 ACCESSORIES

- A. Inserts: For required anchorage into concrete work, furnish inserts of cast iron, malleable iron or 12 gauge steel hot-dip galvanized after fabrication.
- B. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled in, expansion bolt anchors.

2.4 FABRICATION, GENERAL

- A. Fabricate frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site.
- B. Fabricate frames, concealed stiffeners, reinforcement, and edge channels from either cold-rolled or hot-rolled steel (at fabricator's option).
- C. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.
- D. Finish Hardware Preparation: Prepare frames to receive finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.
- E. Reinforce frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.
- F. Locate finish hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware", published by Door and Hardware Institute.

2.5 STANDARD STEEL FRAMES

- A. Provide metal frames for doors, transoms, sidelights, borrowed lights, transom windows and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated.
 - 1. Fabricate frames of minimum 16-gauge cold-rolled furniture steel at interior locations.

2. Fabricate frames with mitered and (face welded / full profile welded).
 3. Fabricate "Knock-Down" frames, where indicated or required.
- B. Hardware reinforcing shall be as follows:
1. All frames are to be mortised reinforced, drilled and tapped in factory for all template mortise hardware, in accordance with "Approved" Finish Hardware Schedule and templates as provided by the Hardware Supplier. Where surface mounted hardware is to be applied, all frames shall have reinforcing plates.
 2. Reinforcement plates shall be as follows:
 - a. Hinge Preps:
 - 1) Masonry: For "F" Series: 7 gauge, minimum.
 - 2) Metal Stud/Drywall: For "DW" Series: 7 gauge, minimum.
 - b. Strike Preps:
 - 1) Masonry: For "F" Series: 12 gauge, minimum.
 - 2) Metal Stud/Drywall: For "DW" Series: 12 gauge, minimum.
 - c. Closure Reinforcement: All Series - 12 gauge, minimum.
 - d. Surface mounted hardware: All Series - 12 gauge, minimum.
 3. Base anchors for frames to be installed in masonry and drywall wall and partition assemblies, shall be adjustable type, shipped loose and to be 14 gauge, minimum.
 4. Jamb Anchors:
 - a. For "F" Series frames in masonry walls provide adjustable wire type anchors (0.156" dia.), or strap type anchors (16 gauge), and "DW" Series frames in metal stud / drywall walls field adjustable compression anchors, provide quantities as follows:
 - 1) Frames up to 7'-6" in height: 3 per jamb.
 - 2) Frames over 7'-6" to 12'-0" in height: 4 per jamb.
 - 3) and one (1) adjustable base anchor per jamb.
 - b. At existing masonry wall opening to remain, provide "Butterfly Existing Wall Anchors", 18 gauge galvanized steel, provide quantities as follows:
 - 1) Frames up to 7'-6" in height: 3 per jamb.
 - 2) Frames over 7'-6" to 12'-0" in height: 4 per jamb.
 - 3) and one (1) adjustable base anchor per jamb.
 5. Reinforce heads and jambs where indicated on drawings with 10 gauge channel, continuously welded to frame.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install standard steel frames and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.
- B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames", unless otherwise indicated.

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- C. **Place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position so that the head and jambs of the frame are square, plumb, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.**
- D. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels.
- E. At in-place masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.
- F. Install fire-rated frames in accordance with NFPA Std. No. 80.
- G. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels, or as indicated. In open steel stud partitions, place studs in wall anchor notches and wire tie. In closed steel stud partitions, attach wall anchors to studs with tapping screws. Use indicated anchors and as per manufacturer's recommendations.

3.2 ADJUST AND CLEAN

- A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
- B. Check and re-adjust operating Finish Hardware items, without causing any damage to frames. Provide complete work for frames, leave clean and in proper operating conditions.

END OF SECTION 08110

SECTION 08211 - WOOD DOORS

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.
- B. Related Sections:
 - 1. Section 01800 - Time of Completion and Liquidated Damages
 - 2. Section 08110 - Hollow Metalwork
 - 3. Section 08700 - Finish Hardware
 - 4. Section 08800 - Glass and Glazing
 - 5. Section 09900 - Field Painting of metal lites

1.2 SUMMARY

- A. Extent and location of each type of flush wood door is indicated on drawings and in the door schedule.
- B. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive plained before veneering. Assembly of face veneer and crossband to core in accordance with WDMA.
 - 1. Structural Composite Lumber (SCL) with wood edge: Compatible species as face veneer.
 - 2. Solid core 20 min. labeled flush Structural Composite Lumber (SCL) with wood edge: Compatible species as face veneer.
- C. Shop-priming of wood doors is included in this Section.
- D. Factory-finishing of wood doors is included in this Section.
- E. Factory-prefitting to frames and factory-premachining for hardware for wood doors is included in this Section.

1.3 QUALITY ASSURANCE

- A. Construction per WDMA I.S. 1A - 11.
- B. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies per ASTM 2074-00 Fire Test (Category A Positive Pressure). For mineral core doors, provide composite blocking with improved screw holding capability as needed to eliminate through-bolting of hardware. They are to be labeled and listed for ratings indicated by UL, Warnock Hersey or other testing and inspection agency acceptable to authorities having jurisdiction. Fire labels shall be affixed at the factory of the door manufacturer, and shall be from the Underwriter's or Warnock Hersey Testing Laboratories. Each label shall show the testing time of the label, and no approval will be given to "Construction Type" labels.

1. All "Category A" doors shall have concealed intumescent seals.
- C. Door Construction Field Examination: Upon direction of the Architect, the Contractor may be instructed to destroy a randomly selected wood door or panel by sawing it in half, vertically and horizontally, to verify conformance of the contract requirements. If the door(s) do not meet the specifications, all of the doors delivered for the project will be rejected, and the doors shall be replaced at the Contractor' expense. Further door inspection, to insure conformity to specifications, shall also be at the expense of the Contractor.
1. All such delays as a result of the fabrication and delivery of non-compliant doors which vary from the processed shop drawing submittal will be the responsibility of the Contractor (refer to Section 01800 for Liquidated Damages).

1.4 REFERENCE STANDARDS

- A. Comply with the applicable requirements of the following standards unless otherwise indicated.
1. Window & Door Manufacturers Association (WDMA)
 - a. I.S. 1A - 11 Architectural Wood Flush Doors (WDMA).
 - b. Standard Procedures and Recommendations for Factory Machining Flush Wood Doors for Hardware.
 2. American National Standards Institute
 - a. ANSI A115. W Series, Wood Door Hardware Standards.
 3. Underwriter's Laboratories, Inc. (UL)
 - a. UL 10C Fire Test
 4. American Society for Testing and Materials:
 - a. ASTM 2074-00 (Category A Positive Pressure) Fire Tests of Door Assemblies.

1.5 SUBMITTALS

- A. **The shop drawing submittal will not be reviewed by the Architect unless a complete shop drawing submittal (technical data, details of core and edge construction, location and extent of hardware blocking, fire ratings, factory finish samples, 8" x 10" minimum for finish and 4" x 5" minimum for construction assembly) are made as one complete submittal, by the Contractor, and will be returned to the Contractor if incomplete.**
1. **Subsequent delays as a result of an incomplete submittal will be the responsibility of the Contractor (refer to Section 01800 for Liquidated Damages).**
- B. Product Data: Door manufacturer's technical data for each type of door, including details of core and edge construction, trim for openings, and factory-finishing specifications.
1. Include certifications as may be required to show compliance with specifications.
 2. **The door manufacturer's shop drawing literature which may include language for the substitution of door construction at the option of the manufacturer is not permitted. Doors which are switched will be rejected and all costs associated with the manufacturing of the door type(s) specified will be by the Contractor/Manufacturer.**

- C. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.
 - 1. For factory-premachined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light openings.
- D. Samples: Submit samples, 8" x 10" minimum for finish and 4" x 5" minimum for construction assembly, for the following:
 - 1. Doors for Transparent Finish: Flat samples illustrating finish and color of wood grain for each species of veneer and solid hardwood lumber required.
 - 2. Factory-Finished Doors: Each type of factory finish required.
 - 3. Metal Frames for Light Openings: Manufacturers product samples or product cut sheets for light frames and color selector guide for each material and finish required.
- E. Warranties and Certification Markings: Furnish with shop drawings:
 - 1. Door supplier must attest, in writing addressed to Architect, that the order has been placed in conformance with specification requirements in all respects.
 - 2. All doors shall carry a "Lifetime" guarantee, including rehang and finish for all door(s) which do not comply with the manufacturer's warranty.
 - 3. Copy of Warranty shall be given to the Architect and Owner prior to the completion of the project.
 - 4. All doors shall be factory marked, on the top of the door, showing the order number, item number on the order, size of finished door, material, and core construction, for future information should replacement of the door be necessary.
- F. The Wood Door Supplier shall provide a letter indicating all of the following:
 - 1. The wood door supplier has completely reviewed the contract documents (drawings, specifications and addenda) and has worked with the distributor in the preparation and submission of a complete shop drawing submittal to the Architect.
 - 2. The wood door supplier shall attest that the order has been placed in accordance with the contract document drawings, specifications and addenda,
 - 3. The wood doors ordered and delivered to the job site are in conformance with the requirements of the job and per the approved shop drawings.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations in WDMA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as with manufacturer's instructions.

- B. Protect all doors from damage and moisture under cover. Use wood blocking under horizontally stored doors. At no time will doors be allowed to come in contact with floor or water.
 - 1. The location where the doors are being stored on the job site shall be between 25 - 55% relative humidity. The Contractor shall forward independent certified testing that confirms compliance.
- C. All doors not finished at factory must be sealed on all surfaces within one (1) week after arrival at jobsite.
- D. Remove all damaged doors from jobsite prior to completion of project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Provide "Heritage Collection" wood doors as manufactured by VT Industries; or approved equal.
 - 1. Products specified herein have been selected because of their quality of construction, configuration, design, function, available finishes, components, accessories, dimensions, shape and style.
 - 2. Comparable products from other manufacturers will be considered if it can be clearly shown that their products are tested, equal to or will exceed the construction quality requirements, intended performances and all other design attributes listed above and provided that deviations in dimensions and profiles are minor and do not materially detract from the design concept or intended performances as judged solely by the Architect.
 - a. Eggers Industries; Architectural Flush Doors Division, a VT Industries company,
 - b. "Aspiro™ Series I Marshfield-Algoma™",
 - c. Or approved equal.
 - 3. The use of one manufacturer's catalog numbers, and the specific requirements set forth in drawings and specifications are not intended to preclude the use of other manufacturer's products or procedures which may be equivalent, but are given for the purpose of establishing a standard of design and quality for materials, construction and workmanship.
 - 4. **Substitutions: Substitution of products will only be considered when the Contractor/ Door Supplier have submitted, to the Architect, all appropriate documents and in the time frame as outlined in the requirements indicated in AIA A201 and Section 00800.**

2.2 MATERIALS AND COMPONENTS

- A. General: Provide wood doors complying with applicable requirements of referenced standards for kinds and types of doors indicated and as specified.
- B. Solid Core Doors for Transparent Finish: Comply with the following requirements:

1. **At existing building, provide veneer faces to match the species of the existing veneer or as directed by the Architect.**
 2. Aesthetic Grade: Custom, with Grade A faces
 3. Species: Match Existing Veneer
 4. Cut: Match Existing for transparent finish; CS-171, Type II.
 5. Match between Veneer Leaves: Match Existing.
 6. Assembly of Veneer Leaves on Door Faces: Match Existing.
 7. Construction: Extra-Heavy Duty Construction, SCLC-5 Bonded (5-ply, with no added urea-formaldehyde glues).
- C. Edges
1. Wood edge, compatible species as face veneer.
 - a. Manufacturers standard construction with hardwood outer.
- D. Core: Structural Composite Lumber Core consisting of an engineered wood product that is made by fusing a network of wood strands together with a water-resistant adhesive to produce a strong, solid and stable product that has true structural properties with excellent screw holding properties and very high split resistance.
1. Core Edge Interface: Vertical and horizontal edges of solid core doors must be securely bonded to the core with waterproof glue containing no added urea formaldehyde resin.
- E. Fire-Rated Solid Core Doors
1. Faces and WDMA Grade: Provide species and grade to match non-rated doors in same area of building, unless otherwise indicated.
 2. Core Construction
 - a. 20 Min. Doors: Single Leaf - Same Structural Composite Lumber Core as noted above.
 3. Edge Construction
 - a. 20 Min. Doors: Single Leaf - Same Structural Composite Lumber with wood edge, compatible species as face veneer.
 - b. All "Category A" doors shall have concealed intumescent seals.
- F. Glazing of Wood Doors:
1. Glazing shall be by the wood door manufacturer.
 2. Glass shall be in accordance with requirements of Section 08800.

2.3 LITE FRAMES

- A. Metal Lite Frames:
 - 1. Standard Metal Vision Frames:
 - a. Basis of Design: Model "LoPro™" as manufactured by Anemostat Door Products.
 - 1) Equivalent by National Guard Products, Inc.
 - 2) or approved equal.
 - b. Material: 20 ga. (1mm) Cold Rolled Steel.
 - c. Finish: Grey Primer, Beige or Bronze Baked Enamel.
 - d. Glazing Thickness: Should be 1/4" (6mm), 3/16" (5mm) or 5/16" (8mm) fire and/or safety rated with UL and/or W.H.I classification markings. Nominal glazing space of 3/8" (10mm) allows for glazing tape to be used on both sides of the glass.
 - e. Fire Ratings with UL & W.H.I Classification markings:
 - 1) 20* Minute: Approved listing at 3204 sq.in. visible lite, max. width 36", max. height 89".
- Note: *Must be used with fire glazing tape as indicated in Section 08800. Glazing combination must be used in appropriately tested door assembly.

2.4 GENERAL FABRICATION REQUIREMENTS

- A. Fabricate wood doors to produce doors complying with following requirements.
- B. In sizes indicated for job-site fitting.
- C. Factory-prefit and premachine doors to fit frame opening sizes indicated with the following uniform clearances and bevels:
 - 1. Comply with tolerance requirements of WDMA for prefitting. Comply with final hardware schedules and door frame shop drawings and with hardware templates.
 - 2. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory premachining.
 - 3. Pre-fit and pre-machine wood doors at factory. Machining shall be in accordance with necessary templates supplied by the Builders Hardware supplier, in accordance with the approved Finish Hardware Schedule for this project. Each door shall be machined for all necessary mortise hardware (ie, locks, hinges, closers, etc.) but face or thru bolt holes shall be done in the field, if such machining is not called for on templates, or is not normally machined at factory. No field preparation will be allowed.
 - 4. Sizing of single doors to be undersized for nominal 1/4 inch, with edges beveled on two edges, as required by the frame manufacturer. Door edges beveled 1/8 inch in 2 inch thickness of door.
 - 5. Door clearances are to be 1/8 inch at top and the bottom shall be a maximum of 1/2 inch, or as required by job condition or labeling requirements.
- D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of doors required.

H. Factory Finish and Uniform Range of Veneers

1. Prefinish wood doors at factory only.
2. All face veneer shall have uniform range of colors, as specified by Architect, in selection of the range of color of the veneer.
3. Comply with recommendations of WDMA for factory finishing of doors, including final sanding, immediately before application of finishing materials.
4. Provide finish WDMA, TR-8, transparent water-based stain and ultraviolet (UV) cured water based polyurethane sealer and topcoat material, color as selected by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install doors using finish hardware in accordance with approved hardware schedule. Protect doors from damage until completion of Project. Except where through bolting is required to meet Code for "A" or "B" label doors, install surface applied hardware on metal or wood doors using all thread screws inserted in pilot drilled holes filled with white acrylic glue.
- B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's printed instructions and of referenced WDMA standard and indicated in the printed instructions provided by the manufacturer.
- C. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA No. 80.
- D. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors.
 1. Machine doors for hardware. Seal cut surfaces after fitting and machining.
- E. Fitting Clearances for Non-Rated Doors: Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.
- F. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
 1. Bevel non-rated doors 1/8" in 2" at lock and hinge edges.
 2. Bevel fire-rated doors 1/8" in 2" in lock edge; trim stiles and rails only to extent permitted by labeling agency.
 3. Prefit Doors: Fit to frames for uniform clearance at each edge.
- G. Factory-Finished Doors: Restore finish before installation, if fitting or machining is required at the job site.

H. Manufacturer of wood doors shall install glass in wood doors.

3.2 ADJUSTING AND PROTECTION

A. Operation: Rehang or replace doors which do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

1. Protect doors, as recommended by door manufacturer, to ensure that wood doors will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 08211

SECTION 08410 - ALUMINUM / FRP DOORS

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 DESCRIPTION OF WORK

- A. The contractor shall furnish all labor, tools, equipment, and services required to remove existing doors and hardware as required to install new frp doors, hardware, glazing, etc. In general, the work under this section includes the following:
 - 1. The removal of all necessary portions of existing doors, hardware and related entrance material to permit the installation of new material as specified hereafter. Material removed shall be disposed of by contractor or salvaged as directed by the architect and/or owner.
 - 2. New masonry opening construction will not require removal of existing doors and frames.
 - 3. The furnish and install of doors, hardware, glazing and sealant, as required, for the installation including all necessary cleaning and adjustments.
- B. The following types of doors and accessories are required:
 - 1. Fiberglass Reinforced Polyester (FRP) Doors.
 - 2. Glazing.
 - 3. Hardware.
- C. Related Sections
 - 1. Section 04200 - Unit Masonry.
 - 2. Section 08415 - Aluminum Storefront System.
 - 3. Section 08700 - Finish Hardware.
 - 4. Section 08800 - Glass and Glazing.

1.3 REFERENCES

- A. Fiberglass Reinforced Polyester (FRP) Flush Doors and Monumental Stile and Rail Door.
 - 1. AAMA 1503-98 - Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
 - 2. ANSI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.
 - 3. ASTM B 117 - Operating Salt Spray (Fog) Apparatus.
 - 4. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.
 - 5. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

6. ASTM D 256 - Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.
7. ASTM D 543 - Evaluating the Resistance of Plastics to Chemical Reagents.
8. ASTM D 570 - Water Absorption of Plastics.
9. ASTM D 638 - Tensile Properties of Plastics.
10. ASTM D 790 - Flexural Properties of Non-reinforced and Reinforced Plastics and Electrical Insulating Materials.
11. ASTM D 1308 - Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
12. ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics.
13. ASTM D 1623 - Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
14. ASTM D 2126 - Response of Rigid Cellular Plastics to Thermal and Humid Aging.
15. ASTM D 2583 - Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
16. ASTM D 5420 - Impact Resistance of Flat Rigid Plastic Specimens by Means of a Falling Weight.
17. ASTM D 6670-01 - Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products.
18. ASTM E 84 - Surface Burning Characteristics of Building Materials.
19. ASTM E 90 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
20. ASTM E 283 - Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
21. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
22. ASTM E 331 - Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
23. ASTM F 476 - Security of Swinging Door Assemblies.
24. ASTM F 1642-04 - Standard Test Method for Glazing Systems Subject to Air blast loading.
25. NWWDA T.M. 7-90 - Cycle Slam Test Method
26. SFBC PA 201 - Impact Test Procedures.
27. SFBC PA 203 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
28. SFBC 3603.2 (b) (5) - Forced Entry Resistance Test.

1.4 PERFORMANCE REQUIREMENTS

A. Fiberglass Reinforced Polyester (FRP) Flush Doors

1. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.
2. Air Infiltration: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 283 at pressure differential of 6.24 psf. Door shall not exceed 0.90 cfm per linear foot of perimeter crack.
3. Water Resistance: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 331 at pressure differential of 7.50 psf. Door shall not have water leakage.
4. Indoor air quality testing per ASTM D 6670-01: GREENGUARD Environmental Institute Certified including GREENGUARD for Children and Schools Certification.
5. Swinging Door Cycle Test, Doors and Frames, ANSI A250.4: Minimum of 25,000,000 cycles.
6. Cycle Slam Test Method, NWWDA T.M. 7-90: Minimum 5,000,000 Cycles.
7. Swinging Security Door Assembly, Doors and Frames, ASTM F 476: Grade 40.
8. Salt Spray, Exterior Doors and Frames, ASTM B 117: Minimum of 500 hours.
9. Sound Transmission, Exterior Doors, STC, ASTM E 90: Minimum of 25.
10. Thermal Transmission, Exterior Doors, U-Value, AAMA 1503-98: Maximum of 0.29 BTU/hr x sf x degrees F. Maximum of R-Value 3.4 Minimum of 55 CRF value.
11. Surface Burning Characteristics, FRP Doors and Panels, ASTM E 84:
 - a. Flame Spread: Maximum of 200. (Class C).
 - b. Smoke Developed: Maximum of 450. (Class C).
12. Surface Burning Characteristics, Class A Option On Interior Faces of FRP Exterior Panels and Both Faces of FRP Interior Panels, ASTM E 84:
 - a. Flame Spread: Maximum of 25.
 - b. Smoke Developed: Maximum of 450.
13. Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 256: 15.0 foot-lbs per inch of notch.
14. Tensile Strength, FRP Doors and Panels, Nominal Value, ASTM D 638: 14,000 psi.
15. Flexural Strength, FRP Doors and Panels, Nominal Value, ASTM D 790: 21,000 psi.
16. Water Absorption, FRP Doors and Panels, Nominal Value, ASTM D 570: 0.20 percent after 24 hours.
17. Indentation Hardness, FRP Doors and Panels, Nominal Value, ASTM D 2583: 55.

18. Gardner Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 5420: 120 in-lb.
19. Abrasion Resistance, Face Sheet, Taber Abrasion Test, 25 Cycles at 1,000 Gram Weight with CS-17 Wheel: Maximum of 0.029 average weight loss percentage.
20. Stain Resistance, ASTM D 1308: Face sheet unaffected after exposure to red cabbage, tea, and tomato acid. Stain removed easily with mild abrasive or FRP cleaner when exposed to crayon and crankcase oil.
21. Chemical Resistance, ASTM D 543. Excellent rating.
 - a. Acetic acid, Concentrated.
 - b. Ammonium Hydroxide, Concentrated.
 - c. Citric Acid, 10%.
 - d. Formaldehyde.
 - e. Hydrochloric Acid, 10%
 - f. Sodium hypochlorite, 4 to 6 percent solution.
22. Compressive Strength, Foam Core, Nominal Value, ASTM D 1621: 79.9 psi.
23. Compressive Modulus, Foam Core, Nominal Value, ASTM D 1621: 370 psi.
24. Tensile Adhesion, Foam Core, Nominal Value, ASTM D 1623: 45.3 psi.
25. Thermal and Humid Aging, Foam Core, Nominal Value, 158°F and 100 % Humidity for 14 Days, ASTM D 2126: Minus 5.14 percent volume change.
26. Compliance with the International Building Code® (IBC), latest NJ Edition.

1.5 SUBMITTALS

- A. Comply with AIA A201 and Section 00800 - Submittal Procedures.
- B. Product Data: Submit door manufacturer's product data, including description of materials, components, fabrication, finishes, and installation.
- C. Submit six sets of factory shop drawings for the fabrication and installation of the Fiberglass Reinforced Polyester (FRP) Doors, Panels, and associated components of the work. Include wall elevations at 1/2" scale, and half-sized detail sections of every typical composite member. Show anchors, joint system, expansion provisions, and other components not included in the manufacturer's standard data. Include field-verified dimensions and glazing details, and include Catalog cuts for all Finish Hardware.
- D. Samples:
 1. FRP Door: Submit corner samples of manufacturer's door showing face sheets, core, internal framing, finish, glazing, hardware, options, and accessories.
 - a. The Architect reserves the right to require samples of typical fabricated sections, showing joints, exposing fastenings, (if any) quality of workmanship, hardware and accessory items, before fabrication of the work proceeds.
 2. Color: Submit manufacturer's color chip samples of Standard of Classic and or Painted FRP Door and Panel Skins and either Standard or Optional Anodized or Painted finished at the Door Stiles and Rails, and Door Perimeter.

- E. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
- F. Manufacturer's Project References: Submit list of successfully completed projects including project name and location, name of architect, and type and quantity of doors manufactured.
- G. Maintenance Manual: Submit manufacturer's maintenance and cleaning instructions for doors, including maintenance and operating instructions for hardware.
- H. Warranty: Submit manufacturer's standard warranty.

1.6 QUALITY ASSURANCE

- A. Standards: Comply with the requirements and recommendations in applicable specifications and standards by NAAMM, AAMA and AA, including the terminology definitions and specifically including the "Entrance Manual" by NAAMM, except to the extent more stringent requirements are indicated.
- B. Code Compliance and Regulations: All materials supplied shall be in accordance with the International Building Code, State of New Jersey "Barrier-Free" Subcode, and all applicable State or Local Codes.
- C. Manufacturer shall have produced Fiberglass Reinforced Polyester (FRP) Doors, and Panels for a recommended ten (10) years, and shall have completed projects similar to this building in type and size.
 - 1. Door components from same manufacturer.
- D. Bidders are expected to visit the jobsite to make a complete survey of project requirements prior to bid. All dimensions, quantities and conditions relating to the installation shall be fully understood. Failure to visit the site will not relieve the successful bidder from the responsibility of furnishing all materials and services required to comply with the true intent and meaning of the specifications without any additional costs to the Owner.
- E. Instructions: The manufacturer or representatives will be available for consultation to all parties engaged in the project, including instruction to installation personnel.
- F. An examination of product will include cutting and/or disassembly of the entrance to reveal the construction of the particular component. If the door, or component fails, replacement of the project's material will be required. This process will assure the owner of proper adherence to the bid documents.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All materials supplied shall be delivered to the jobsite in their original, unopened packages, with labels intact. Materials shall be inspected for damage, and the manufacturer shall be advised immediately of any discrepancies. Unsatisfactory materials are not to be used.
- B. All materials supplied shall be packaged in individual corrugated cartons. Doors and panels shall be "floated" within cartons, with no portion of the door having contact with the outer shell of the container.
- C. Handling: Protect materials and finish from damage during handling and installation.

1.8 SPECIAL PROJECT WARRANTY

- A. Provide a written warranty, signed by Manufacturer, Installer and Contractor, agreeing to replace, at no cost to the Owner, any doors, or panels that fail in materials or workmanship, within the time period of acceptance, as indicated below.
 - 1. Failure of materials or workmanship includes excessive deflection, faulty operation of entrances, deterioration of finish, or construction, in excess of normal weathering and defects in hardware, weather-stripping and other components of the work.
- B. Warranty Period: **Ten (10) years** from approved date of Substantial Completion as determined by the Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. **FRP Doors:** Basis-of-Design: Special-Lite Inc.; or approved equal.
 - 1. Subject to compliance with requirements, provide either the named product or product by one of the following manufacturers:
 - a. FRP Architectural Doors Inc.
 - b. Vale Company.
 - c. Or approved equal.

2.2 FIBERGLASS REINFORCED POLYESTER (FRP) FLUSH DOORS

- A. Model: **SL-17** Flush Doors with SpecLite3; or approved equal, fiberglass reinforced polyester (FRP) face sheets.
- B. Door Opening Size: As indicated on the drawings.
- C. Door Construction:
 - 1. Doors are to be 1-3/4" thick Special-Lite, Series SL-17. (FRP); or approved equal.
 - 2. Stiles and Rails: Constructed of aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T5 alloy recovered from industrial processes, minimum/maximum 2-5/16-inch depth, joined with steel tie rods.
 - 3. Stiles to be tubular shape to accept hardware as specified.
 - 4. Top and bottom rails to be extruded with legs for interlocking "rigidity weather bar."
 - 5. Corners: Mitered or butted mortise and tenon joints.
 - 6. Joinery to be 3/8" tie rods, top and bottom, bolted through an extruded spline, in both top and bottom rails with 3/16" mechanically fastened (screwed) reinforcing angles, and secured with hex type nuts. Welds, glue, or other methods are not acceptable.
 - 7. All doors shall be pre-machined in accordance with templates from the hardware manufacturer. For surface applied hardware, doors shall have necessary reinforcement, including the attachment of RIVNUT blind bolt fasteners. With the exception of door closers and holders, which require field applications, doors are to be shipped with hardware attached.

8. Vision Lites: Provide glazed openings in doors as indicated, with manufacturer's standard aluminum moldings and stops, with removable stops on inside only. Glass to be "factory installed" for warranty purposes. Refer to Section 08800 - Glass and Glazing for type.
9. Face sheets to be locked in with extruded interlocking edges, which are the integral reglets of the Vertical and Horizontal rails permitting a flush appearance.
10. Core is to be of **foamed in place Urethane foam** minimum of 5 lbs. per cubic foot density. **Minimum R Value of 9.**
 - a. All doors are to be properly reinforced for hardware prior to urethane core foaming in door.
11. Face sheets for Fiberglass Reinforced Polyester (FRP) Doors are to be Kemlite SpecLite3®; or approved equal; 1/2" thick (pebble like texture) with color throughout. Color: Standard and or Classic as approved by the Architect.

2.3 MATERIALS AND ACCESSORIES - Fiberglass Reinforced Polyester (FRP) Flush Doors

- A. Aluminum Members: Provide alloy and temper as recommended by manufacturer for strength, corrosion resistance, and application of required finish and control of color; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate, with a minimum wall thickness of 0.125"
- B. All materials shall be of the same manufacturer. No splitting of Door or components will be permitted.
- C. Fasteners: Provide aluminum, non-magnetic stainless steel or other non-corrosive metal fasteners, guaranteed by the manufacturer to be compatible with the doors, stops, panels, hardware, anchors, and other items being fastened. For exposed fastener (if any), provide Vandal-proof flat head screws with finish matching the item to be fastened.
 1. Do not use exposed fasteners, except where unavoidable for the assembly of units, or unavoidable for the fastening of hardware. Provide only concealed screws in glazing stops.
- D. Reinforcement and Brackets: Manufacturer's standard formed or fabricated steel units, of shapes, plates, or bars, with 2.0 ounce hot-dip zinc coating, complying with ASTM A 123, applied after fabrication.
- E. Expansion Anchor Devices: Lead shield or toothed steel, drill-in, expansion bolt anchors.
- F. Bituminous Coating: Cold applied asphalt mastic complying with SPC-PS 12, compounded for 30-mil thickness per coat.
- G. Sealants and Gaskets: Provide sealants and gaskets in the fabrication, assembly and installation of the work, which are recommended by the manufacturer to remain permanently elastic, non-shrinking, non-migrating and weatherproof.
- H. Glazing Gaskets: For glazing factory-installed glass, and for gaskets, which are factory-installed in "captive" assembly of glazing stops, provide manufacturer's standard stripping of molded neoprene, complying with ASTM D 2000 (Designation 2BC415 to 3 BC620), or molded PVC complying with ASTM C 509, Grade 4.

2.4 FABRICATION

- A. Sizes and Profiles: The required sizes for door units and profiles requirements are to be "field verified".
- B. Coordination of Fabrication: Check the actual door openings in the construction work by accurate field measurements before fabrication, and show recorded measurements on final shop drawings.
- C. Assembly:
 - 1. Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to the cleaning, finishing, treatment and application for coatings.
 - 2. Remove burrs from cut edges, and ease edges and corners to a radius of approximately 1/64".
- D. Welding: No Welding of any Door joints will be accepted.
- E. Fasteners: Conceal fasteners, wherever possible, except as otherwise noted.
- F. Fit:
 - 1. Maintain continuity of line and accurate relation of planes and angles.
 - 2. Provide secure attachments and support at mechanical joints, with hairline fit at contacting members.
- G. Reinforce the work as necessary for performance requirements, as required, for support to the structure. Separate dissimilar metals and bituminous paint or performed separators, which will prevent corrosion. Separate metal surfaces at moving joints with non-metallic separators to prevent "freeze-up" of joints.

2.5 HARDWARE

- A. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
- B. Factory install hardware.
- C. Hardware Schedule: As indicated on the drawings and as specified in Section 08700.

2.6 GLAZING AND VISION LITES

- A. Provide glazing system for doors to receive lites. Design system for replacement of glass, but for non-removal of glass from the exterior.
 - 1. Provide anchorage and alignment brackets for concealed support of assembly from the building structure. Allow for thermal expansion on exterior units.
 - 2. All glass in doors is to be factory installed.
 - 3. Glass for exterior doors to be: As detailed on the drawings. Refer to Section 08800.
- B. Factory Glazing: 1-inch glass insulating units.

- C. Lites in Exterior Doors: Allow for thermal expansion.
- D. Rectangular Lites:
 - 1. Size: As indicated on drawings.
 - 2. Factory glazed with screw-applied aluminum stops anodized to match perimeter door stile and rails.

2.7 ALUMINUM FINISH

- A. Painted Finish:
 - 1. High-Performance Organic Coating: AAC12C42R1X (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Chemical conversion coating, acid chromate-fluoride-phosphate pre-treatment; Organic Coating: as specified below). Prepare, pre-treat and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions. (Trade name for this process: KYNAR).
 - 2. Fluorocarbon 2-Coat Coating System: Manufacturer's standard 2-coat thermocured system, complying with AAMA 605.2, composed of specifically formulated inhibitive primer and fluorocarbon color top coat containing not less than 70 percent polyvinylidene fluoride resin by weight.
 - a. Color: As selected by Architect from Manufacturer's Standard and Custom Color Chart.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive doors. 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 frames are plumb, level, square, and in tolerance.

3.3 INSTALLATION (Fiberglass Reinforced Polyester (FRP))

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Set thresholds in bed of mastic and backseal.
- D. Install exterior doors to be weathertight in closed position.
- E. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- F. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.5 ADJUSTING

- A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.6 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage finish or glazing.

3.7 PROTECTION

- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 08410

SECTION 08415 - ALUMINUM STOREFRONTS

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. Aluminum Framing for Doors, Side Lites and Transoms.
 - 2. Aluminum Framing for Storefronts applications.
- B. Related Sections include the following:
 - 1. Section 07900 - Joint Sealer Assemblies.
 - 2. Section 08410 - Aluminum / FRP Doors.

1.3 SYSTEM DESCRIPTION

- A. General: Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:
 - 1. Air infiltration and water penetration exceeding specified limits.
 - 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
- B. Glazing: Physically and thermally isolate glazing from framing members.
- C. Glazing-to-Glazing Joints: Provide glazing-to-glazing joints that accommodate thermal and mechanical movements of glazing and system, prevent glazing-to-glazing contact, and maintain required edge clearances.
- D. Structural Silicone-Sealant Joints: Provide systems with structural silicone-sealant joints complying with the following requirements:
 - 1. Tensile or shear stress in joints is less than 20 psi.
 - 2. Structural sealant withstands tensile and shear stresses imposed by storefront systems without failing adhesively or cohesively. When tested for adhesive compatibility with each substrate and condition required, provide sealant that fails cohesively before it fails adhesively. Adhesive and cohesive failure are defined as follows:
 - a. Adhesive failure occurs when sealant pulls away from a substrate cleanly, leaving no sealant material behind.

- b. Cohesive failure occurs when sealant breaks or tears within a joint but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.
- E. Thermally Broken Construction: Provide systems that isolate aluminum exposed to exterior from aluminum exposed to interior with a material of low thermal conductance.
 - 1. Poured and debridged urethane thermal barriers shall not be permitted.
- F. Wind Loads: Provide storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.
 - 1. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller, unless otherwise indicated.
 - 2. Static-Pressure Test Performance: Provide entrance and storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.
 - a. Test Pressure: 150% of inward and outward wind-load design pressures.
 - b. Duration: As required by design wind velocity; fastest 1 mile of wind for relevant exposure category.
- G. Dead Loads: Provide entrance- and storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.
 - 1. Provide a minimum 1/8-inch clearance between members and top of glazing or other fixed part immediately below.
 - 2. Provide a minimum 1/16-inch clearance between members and operable and doors.
- H. Live Loads: Provide entrance and storefront systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.
- I. Air Infiltration: Provide entrance and storefront systems with permanent resistance to air leakage through fixed glazing and frame areas of not more than 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft.
- J. Water Penetration: Provide entrance and storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 12.0 lbf/sq. ft. Water leakage is defined as follows:

1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
- K. Thermal Movements: Provide entrance and storefront systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.
 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F material surfaces.
- L. Structural-Support Movement: Provide entrance and storefront systems that accommodate structural movements including, but not limited to, sway and deflection.
- M. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.1.
- N. Average Thermal Conductance: Provide storefront systems with average U-values of not more than 0.63 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.1.
- O. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.4 SUBMITTALS

- A. Shop Drawings: Submit shop drawings showing adaptation of the manufacturer's standard system to the project; include typical unit elevations at 1/2" scale and details at 3" scale, to show dimensioning, member profiles, anchorage system, interface with building construction, and glazing. Indicate the section module of wind-load-bearing members, and calculations of stresses and deflections for performance under design loading. Show clearly where and how the manufacturer's system deviates from contract drawings and these specifications.
 1. Engineering Responsibility: Manufacturer's fabrication and shop drawings, design calculations and other structural data shall be prepared, signed and sealed by a qualified structural engineer licensed in the State of New Jersey.
- B. Product Data: Submit manufacturer's specifications for materials and fabrication of storefront system, and instructions and recommendations for installation and maintenance. Include certified test reports showing compliance with requirements where a test method is indicated.
- C. Samples: Submit samples of each type and color of aluminum finish, on 12" long sections of extrusions or formed shapes and on 6" squares of sheet or plate. Include 2 or more samples in each set, showing near-limits of variations, if any, in color and texture of finish.

1. The Architect reserves the right to require fabrication samples showing the following:
 - a. Prime members.
 - b. Joinery.
 - c. Anchorage.
 - d. Expansion provisions.
 - e. Glazing and similar details.
 - f. Profiles.
 - g. Intersections.

- D. Test Reports: Submit certified copies of previous test reports which have been performed by Independent Laboratory substantiating performance of the system and indicating compliance with requirements of the Contract Documents.

- E. Certificates of Conformance: Submit Manufacturer/Installer/Contractor certificates indicating conformance with specified system. Certificates shall be signed and notarized by an authorized officers and representatives.

1.5 QUALITY ASSURANCE

- A. Delegated Design:
 1. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated. Designated Design includes, but is not limited to:
 - a. Aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by a qualified professional engineer responsible for their preparation in the State of New Jersey.
 2. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.
 - a. Engineering Responsibility: Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

- B. Testing Agency Qualifications: Demonstrate to Architect's satisfaction, based on Architect's evaluation of criteria conforming to ASTM E 699, that the independent testing agency has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

- C. Source Limitations: Obtain each type of entrance and storefront system through one source from a single manufacturer.

- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to the Architect for review.
- E. Preconstruction Sealant Testing: Perform sealant manufacturers' standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants and each condition required by system.
1. Test a minimum of 8 samples of each metal, glazing, and other material.
 2. Prepare samples using techniques and primers required for installed systems.
 3. Perform tests under environmental conditions that duplicate those under which systems will be installed.
 4. For materials that fail tests, determine corrective measures required to prepare each material to ensure compatibility with and adhesion of sealants, including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.
- F. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code–Aluminum."
- G. Mockups: Before installing entrance and storefront systems, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect 7 calendar days in advance of the dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Architect's approval of mockups before proceeding with installation of systems.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. When directed, demolish and remove mockups from Project site.

- b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating systems without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.7 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of entrance and storefront systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
 - 1. Structural failures including, but not limited to, excessive deflection.
 - 2. Adhesive sealant failures.
 - 3. Cohesive sealant failures.
 - 4. Failure of system to meet performance requirements.
 - 5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 6. Failure of operating components to function normally.
 - 7. Water leakage through fixed glazing and frame areas.
- C. Warranty Period: **Ten (10) years** from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Provide "Series 403-i Storefront Framing, as manufactured by EFCO Corporation; or approved equal.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.

1. Sheet and Plate: ASTM B 209.
 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Bars, Rods, and Wire: ASTM B 211.
 5. Welding Rods and Bare Electrodes: AWS A5.10.
- B. Steel Reinforcement: Complying with ASTM A 36 for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 for hot-rolled sheet and strip.
- C. Glazing shall be 1" thick insulating glass as specified in Division 8 Section "Glass and Glazing."
- D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.
- E. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
- F. Structural Silicone Sealant: Type recommended by sealant and system manufacturers that complies with ASTM C 1184 requirements, is compatible with system components with which it comes in contact, and is specifically formulated and tested for use as a structural sealant.
1. Color: As selected by Architect from manufacturer's full range of colors.
 2. Tensile Strength: 100 psi minimum.
 3. Provide sealant with modulus of elasticity that will not allow movement of more than 25 percent of joint width, unless less movement is required by structural-sealant-glazed systems' design.
 4. Use neutral-cure silicone sealant with insulating-glass units.
- G. Secondary Sealant: For use as weatherseal, compatible with structural silicone sealant and other system components with which it comes in contact, and that accommodates a 50 percent increase or decrease in joint width at the time of application when measured according to ASTM C 719.
1. Color: As selected by Architect from manufacturer's full range of colors.
 2. Use neutral-cure silicone sealant with insulating-glass units.
- H. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

- I. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 7 Section "Joint Sealer Assemblies".
- J. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat. Color: Black.

2.3 COMPONENTS

- A. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.
- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Reinforce members as required to retain fastener threads.
 - 2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.
- C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.
- E. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, complying with ASTM A 666, of type selected by manufacturer for compatibility with system.
- F. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:
 - 1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.
 - 2. Sliding Weather Stripping: Wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing complying with AAMA 701 requirements.

2.4 FABRICATION

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

1. Fabricate components for head- and sill-receptor frame construction with shear-block construction at intermediate horizontal components.
- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.
- D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- E. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- F. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."
- G. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.5 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Preparation: Prior to fabrication of doors and frames, prepare the aluminum surfaces for finishing in accordance with the aluminum producer's recommendations and the standards of the finisher or processor. Process all components of each assembly simultaneously to attain complete uniformity of color.

- E. Fluoropolymer Coating: Full strength 70% "Kynar 500/Hylar 5000" coating baked on for 15 minutes at 450 degrees F in a dry film thickness of 1.0 mil, 30% reflective gloss (ASTM D 523), over minimum 0.2 mil baked on modified epoxy primer.
1. Durability: Provide coating which has been field tested under normal range of weathering conditions for minimum of 20 years without significant peel, blister, flake, chip, crack or check in finish, and without chalking in excess of 8 (ASTM D 659), and without fading in excess of 5 NBS units.
 2. Colors: Colors shall be as shown on drawings or as selected by Architect from manufacturer's available full range of colors.
 3. Special Warranty for Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace aluminum framing system that show evidence of deterioration of factory applied finishes within specified warranty period.
 - a. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - 1) Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - 2) Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - 3) Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - b. Finish Warranty Period: **Ten (10) years** from approved date of Substantial Completion.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealer Assemblies."
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
 - 1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
- G. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.
 - 1. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
 - 2. Install structural silicone sealant according to sealant manufacturer's written instructions.
 - 3. Mechanically fasten glazing in place until structural sealant has cured in accordance with manufacturer's recommendations.
 - 4. Remove excess sealant from component surfaces before sealant has cured.
- H. Install secondary-sealant weatherseal according to sealant manufacturer's written instructions to provide weatherproof joints. Install joint fillers behind sealant as recommended by sealant manufacturer.
- I. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.
- J. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:
 - 1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet; 1/4 inch over total length.
 - 2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
 - 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing agency to perform field quality-control testing indicated.
- B. Structural-Silicone-Sealant Adhesion Test: Test installed structural silicone sealant according to field adhesion test method described in AAMA CW #13, "Structural Sealant Glazing Systems (A Design Guide)."
 - 1. Test a minimum of 2 areas.
- C. Water Spray Test: After completing the installation of test areas indicated, test storefront system for water penetration according to AAMA 501.2 requirements.
- D. Repair or remove and replace Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.4 ADJUSTING AND CLEANING

- A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.
- B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.5 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08415

SECTION 08700 – FINISH HARDWARE

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 commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- D. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
 - 3. ANSI/UL 294 - Access Control System Units.
 - 4. UL 305 - Panic Hardware.
 - 5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols,

hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
 2. Plans for existing and future key system expansion.
 3. Requirements for key control storage and software.
 4. Installation of permanent keys, cylinder cores and software.
 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified

electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Please note that ASSA ABLOY is transitioning the Yale Commercial brand to Arrow. This affects only the brand name; the products and product numbers will remain unchanged. The brand transition is expected to be complete in or about May of 2024, and products shipping after that time will be branded Arrow.
- D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01,

Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
 5. Manufacturers:
 - a. McKinney (MK) - TA/T4A Series, 5 knuckle.
 - b. Or approved equal

2.3 CONTINUOUS HINGES

- A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
1. Where specified, provide modular continuous geared hinges that ship in two or three pieces and form a single continuous hinge upon installation.

2. Manufacturers:
 - a. Pemko (PE).
 - b. Or approved equal

2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.
 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 2. Furnish dust proof strikes for bottom bolts.
 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 5. Manufacturers:
 - a. Rockwood (RO).
 - b. Or approved equal
- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 4. Pulls, where applicable, shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
 5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
 6. Manufacturers:
 - a. Rockwood (RO).
 - b. Or approved equal

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
 1. Manufacturers:
 - a. Match Existing, Field Verify.

- B. Keying System: Each type of lock and cylinders to be factory keyed.
 - 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 - 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 - 3. Existing System: Field verify and key cylinders to match Owner's existing system.
- C. Key Quantity: Provide the following minimum number of keys:
 - 1. Change Keys per Cylinder: Two (2)
 - 2. Master Keys (per Master Key Level/Group): Five (5).
- D. Key Registration List (Bitting List):
 - 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 - 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 CYLINDRICAL LOCKS AND LATCHING DEVICES

- A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed.
 - 1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - CLX3300 Series.
 - b. Oak Security Group (OK) - 1CL 2CSI1H2A.
 - c. Or approved equal

2.7 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.8 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. Exit devices shall have a five-year warranty.
 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 6. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
 7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
 - b. Or approved equal

2.9 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Heavy duty surface mounted door closers shall have a 30-year warranty.
 2. Manufacturers:
 - a. Norton Rixson (NO) - 7500 Series.
 - b. Or approved equal
- C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.
1. Manufacturers:
 - a. Norton Rixson (NO) - Unitrol Series.
 - b. Or approved equal

2.10 ARCHITECTURAL TRIM

- A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Rockwood (RO).
 - b. Or approved equal

2.11 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Manufacturers:
 - a. Rockwood (RO).
 - b. Or approved equal
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 1. Manufacturers:
 - a. Norton Rixson (RF).
 - b. Rockwood (RO).
 - c. Sargent Manufacturing (SA).

2.12 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 - 1. Pemko (PE).
 - 2. Or approved equal

2.13 ELECTRONIC ACCESSORIES

- A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
 - 1. Manufacturers:
 - a. Securitron (SU) - DPS Series.
 - b. Or approved equal

2.14 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.15 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handing and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Manufacturer's Abbreviations:
 - 1. MK - McKinney
 - 2. PE - Pemko
 - 3. RO - Rockwood
 - 4. RU - Corbin Russwin
 - 5. OT - Other
 - 6. RF - Rixson
 - 7. NO - Norton
 - 8. SU - Securitron
 - 9. OK - Oak Security Group

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Hardware Sets

Set: 1.0

Doors: 305A.2

2 Continuous Hinge	CFM-SLF-HD1-M		PE
1 Flush Bolt	2845 / 2945	US26D	RO
1 Mortise Exit Device, Nightlatch	ED5657L N9M57ET M110	630	RU
1 Mortise Cylinder	- Match Owner's existing key system	626	OT
1 Conc Overhead Stop	6-X36	630	RF
1 Surface Closer	UNI7500	689	NO
1 Weatherstrip	- Integral within construction of door and frame assembly		OT
2 Sweep	29326CNB TKSP		PE
1 Threshold	1715AK MSES25SS		PE
2 Position Switch	DPS-M-BK		SU ⚡
1 Wiring Diagram	- Elevation and Point to Point as Specified		OT

Notes: Add kick plate

*****FIELD VERIFY SPECIFIED HARDWARE IS COMPATIBLE WITH EXISTING CONDITIONS*****

Door position switches to monitor / report open closed status of opening to security system.

Set: 2.0

Doors: 305B

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom Lock	CLX3357 NZD LC	626	RU
1 Cylinder	- Match Owner's existing key system	626	OT
1 Surface Closer	CPS7500	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
3 Silencer	608 / 609		RO

Notes: Add wall stop

*****FIELD VERIFY SPECIFIED HARDWARE IS COMPATIBLE WITH EXISTING CONDITIONS*****

Set: 3.0

Doors: 305.2

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Lock	CLX3355 NZD LC	626	RU
1 Cylinder	- Match Owner's existing key system	626	OT
1 Conc Overhead Stop	2-X36	630	RF
1 Gasketing	ACP112BL/2		PE
1 Gasketing	S44BL		PE
1 Gasketing	S773BL		PE
1 Door Bottom	STC411APK		PE

Notes: Add wall stop; kick plate

Set: 4.0

Doors: 305.1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Communicating Lock	CLX3362 NZD LC	626	RU
2 Cylinder	- Match Owner's existing key system	626	OT
1 Wall Stop	406 / 409	US32D	RO
1 Gasketing	ACP112BL/2		PE
1 Gasketing	S44BL		PE
1 Gasketing	S773BL		PE
1 Door Bottom	STC411APK		PE

Notes:

Set: 5.0

Doors: 305, 305A

3 Hinge (heavy weight)	T4A3786	US26D	MK
1 Classroom Intruder Lock	1CL 2CSI1H2A	626	OK
2 Cylinder	- Match Owner's existing key system	626	OT
1 Surface Closer	PR7500	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US32D	RO
1 Gasketing	ACP112BL/2		PE
1 Gasketing	S44BL		PE
1 Gasketing	S773BL		PE
1 Door Bottom	STC411APK		PE

Notes:

*****FIELD VERIFY SPECIFIED HARDWARE IS COMPATIBLE WITH EXISTING CONDITIONS*****

END OF SECTION 08700

SECTION 08800 - GLASS AND GLAZING

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.
- B. Related Sections:
 - 1. Section 08110 - Hollow Metalwork.
 - 2. Section 08211 - Wood Doors.
 - 3. Section 08410 - Aluminum/FRP Doors.
 - 4. Section 08415 - Aluminum Storefront.

1.2 SUMMARY

- A. Extent of glass and glazing work is indicated on drawings and schedule.
- B. Types of work or locations requiring glass and glazing include, but are not limited to, glass types scheduled herein and on the drawings.
 - 1. Doors.
 - 2. Interior borrowed lites.

1.3 QUALITY ASSURANCE

- A. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- C. Safety Glass: Categories I and II materials complying with testing requirements in CPSC 16CFR1201 and permanently marked with label of:
 - 1. Safety Glazing Certification Council (SGCC).
- D. Insulating Glass Seal Standard: Comply with ASTM E 774, Class C.
 - 1. Comply with International Building Code for insulated tempered glass.
 - 2. Label each unit permanently on spacer or on one pane.
 - 3. Certification agency:
 - a. Insulating Glass Certification Council (IGCC).
 - b. Associated Laboratories, Inc. (ALI).

- E. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator with a recommended 5 years of successful experience in the production of each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.
- F. Installer (Glazier): A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program
 - 1. Firm with a recommended 5 years of successful experience in glazing work similar to required work.
- G. All glass shall bear the Label of the manufacturer.
- H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with an appropriate certification label of IGCC.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including documentation of compliance with requirements and instructions for handling, storing, installing, cleaning and protecting each type of glass and glazing material, and installation and maintenance instructions.
- B. Before any glass is delivered to the job site, submit sections and details of glass installation at framing members.
- C. Samples: Submit for verification purposes, 12" square samples of each type of glass indicated except for clear single pane units, and 12" long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system in color.
 - 1. Submit insulating glass samples with completed edge-seal construction, but hermetic seal need not be maintained.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.6 PROJECT CONDITIONS

- A. Examine framing and substrate work to receive glass and glazing materials, and condition under which glass is to be installed. Do not proceed with glazing until unsatisfactory conditions have been corrected.
- B. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1. Install liquid sealants at ambient and substrate temperatures above 40°F.

1.7 WARRANTY

- A. Manufacturer's Special Warranty on Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for those coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 1. Warranty Period: **Ten (10) years** from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 1. Warranty Period: **Ten (10) years** from date of Substantial Completion.
- C. Manufacturer's Limited Warranty on Fire-Rated / Impact Gazing: Written warranty, made out to the Owner and signed by manufacturer, warrants only that the product will be free of manufacturing defects resulting in material obstruction through the glass area and/or edge separation and changes in properties of the interlayer for a period of **five (5) years** from the date of purchase, provided the Products have been properly shipped, stored, handled, installed and maintained.
 1. Limitation of Remedy - Inspection: The remedy for product proved to be defective under the terms of this warranty is limited to shipment of replacement product. With respect to all claims under this warranty, the Manufacturer shall have the right to inspect any and all products alleged to be defective.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include; but are not limited to, the following:
 1. Standard Glass, Insulating Glass Products:
 - a. Pilkington, Libbey-Owens-Ford, (LOF)
 - b. Vitro Architectural Glass (formally PPG Glass)
 - c. Guardian Industries Corp.
 - d. Or approved equal.
 2. Fire Rated Glass Assemblies:
 - a. Pyran® Platinum F by Schott Glass Products.
 - b. Or approved equal.

2.2 PRIMARY GLASS PRODUCTS

- A. Clear Float Glass: ASTM C 1036, Type I (transparent glass, flat), Class 1 (clear), Quality-Q3 (glazing select).

- B. Heat Treated Float Glass (Tempered Plate Glass): ASTM C 1048; Type I; Quality-Q3; Class I (clear)
 - 1. Provide prime glass of color and type indicated, which has been heat treated to strengthen glass in bending to not less than 4.5 times annealed strength.
- C. Uncoated Tinted Float Glass: Type I (transparent glass, flat), Class 2 (tinted heat absorbing and light reducing), Quality-Q3 (glazing select), and as follows:
 - 1. Manufacturer's standard **clear**, with visible light transmittance of 70% and shading coefficient of 0.44 for 1/4" thick glass.
- D. Energy Advantage Low-E Glass: Manufacturer's standard clear color Low-E glass, coated on third surface with light transmittance:
 - 1. Clear: 33% and shading coefficient of .44 for 1/4" thick glass.

2.3 INSULATING GLAZING

- A. Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
- B. Provide insulating glass for applications in exterior doors, side lites, storefront units, curtain wall systems, aluminum windows and as follows:
 - 1. Exterior pane shall 1/4-inch thick tinted glass to meet indicated requirements.
 - 2. Interior pane shall be 1/4-inch thick "Low-E" coating on the third surface.
 - 3. Units shall be tempered where within 6 feet of a door or where "tempered" or "safety" glass is required by Code.
 - 4. Double Glass Performance Data:
 - a. Clear:
 - 1) Visible light transmittance of 70%,
 - 2) Solar Energy Transmittance of 33%,
 - 3) U-Factor: Summer (Air) of 0.27,
 - 4) U-Factor: Winter (Air) of 0.29,
 - 5) Solar Heat Gain Coefficient of 0.38,
 - 6) Shading coefficient of 0.44.

2.4 FIRE-RATED / IMPACT GLAZING AND FRAMING ASSEMBLIES

- A. Fire protection rated and impact safety rated glazing material with a thickness (indicated below), made from a patented directional specialty tempered glazing or laminated glass ceramic with a transparent appearance.
 - 1. Units are tested listed and labeled by Underwriters Laboratories Inc., UL, for the following applications and comply with the following Agencies:

- a. Classified and labeled by Underwriters Laboratories, Inc.®. Test report number for labeled fire-rated assemblies is UL File No. R22036.
 - b. All above tests performed in accordance with UL 9, UL 10B, UL 10C, NFPA 257, NFPA 80, ASTM E2010-01, ASTM E2074-00.
 - c. This product is not considered a barrier to radiant heat and has not met the ASTM E-119 or UL 263 test standards.
 - d. Fire rated for up to 90 minutes with required hose-stream test.
 - e. Fire-rated for up to 180 minutes in doors with required hose-stream test.
 - f. Withstands thermal shock.
3. Impact rating: ANSI Z97.1 (Class A) and CPSC 16CFR1201 (Cat. I and II).
 4. Passes positive pressure test standard UL 10C.
 5. Laminated floated glass-ceramic.
 6. Clear and colorless without the distracting amber tint associated with competitive glass-ceramics. Microfloat process allows for smooth surface and distortion-free mirror finish.
 7. Approved for use with any fire-rated frame.
 8. Sound Transmission Class (STC): 36
 9. The panel must be placed on calcium silicate or hardwood setting blocks and glazed using PYRAN® Platinum classified glazing tape, such as closed cell PVC, Fiberfrax tape or Pemko FG3000S90; or approved equal.
- B. Subject to compliance with requirements, provide fire-rated impact glazing, as follows:
1. FRIG-1: Fire-Rated / Impact Glazing - Provide Pyran® Platinum F (filmed) by Schott Glass Products; or approved equal.
 - a. Doors with fire rating requirements of up to 90 minutes.
 - 1) Doors, Non-Temperature Rise - Maximum exposed area of glazing = 3,708 sq. in.
 - a) Maximum: Width = 37-3/4" & Height = 94-1/4".
 - 2) Thickness: 3/16"
 - 3) Provide 5/8" glazing stops.
 - b. Doors, Temperature Rise and Non-Temperature Rise of up to 180 minutes.
 - 1) Maximum exposed area of glazing = 100 sq. in.
 - a) Maximum: Width = 12" & Height = 33".
 - 2) Thickness: 3/16"
 - 3) Provide 5/8" glazing stops.
 - c. Other than Doors with fire rating requirements of up to 90 minutes.
 - 1) Maximum exposed area of glazing = 4,933 sq. in.
 - a) Maximum: Width = 98-1/4" & Height = 98-1/4".
 - 2) Thickness: 3/16"
 - 3) Provide 5/8" glazing stops.

2.5 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES

- A. General: Provide color of exposed glazing sealant compound as selected by Architect from manufacturer's standard colors, or black if no color is so selected. Comply with manufacturer's recommendations for selection of hardness, depending upon the location of each application, conditions at time of installation, and performance requirements as indicated. Select materials, and variations or modifications, carefully for compatibility with surfaces contacted in the installation.
- B. 1 Part Silicone Rubber Glazing Sealant: Elastomeric silicone sealant complying with FS TT-D-001543, Class A, non-sag. Provide acid type recommended by manufacturer where only non-porous bond surfaces are contacted; provide non-acid type recommended by manufacturer where one or more porous bond surfaces are contacted.
- C. Butyl Rubber Glazing Tape: Partly-vulcanized, self-adhesive, non-staining, elastomeric butyl rubber tape. 98% solids, intended for 35% compression, no appreciable deterioration for 3000 hour test in Atlas Weatherometer; either plain or pre-shimmed as required for proper installation of glass.

2.6 GLAZING COMPOUND FOR FIRE-RATED GLAZING MATERIALS

- A. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent. Glass panels that exceed 1,393 sq. inches for 90-minute ratings must be glazed with fire-rated glazing tape supplied by manufacturer.
 - 1. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.
 - a. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.
- C. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.
 - A. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.
 - B. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.2 STANDARDS AND PERFORMANCE

- A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.
- B. Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.
- C. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Inspect each piece of glass immediately before installation, and discard pieces which have significant edge damage or face imperfections.
- F. Unify appearance of each series of lites by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other piece.
- G. Install insulating glass units to comply with recommendations by Sealed Insulating Glass Manufacturers Association, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

3.3 PREPARATION FOR GLAZING

- A. Clean glazing channel and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrate. Remove lacquer from metal surfaces where elastomeric sealants are used.
- B. Apply primer or sealer to joint surfaces where recommended by sealant manufacturer.

3.4 GLAZING

- A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.
- B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.
- D. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
- E. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.
- F. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
- G. Tool exposed surfaces of sealants to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.
- H. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement.
- I. Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.5 PROTECTION AND CLEANING

- A. Cure glazing sealants and compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.
- B. Protect glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.
- C. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

- D. Maintain glass in a reasonably clean condition during construction, so that it will not be damaged by corrosive action and will not contribute (by wash-off) to deterioration of glazing materials and other work. Comply with manufacturer's instructions.
- E. Wash and polish glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Comply with glass manufacturer's recommendations for final cleaning.

END OF SECTION 08800

SECTION 09250 - GYPSUM DRYWALL

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. Extent of each type of gypsum drywall construction required is indicated on the drawings.
- B. This Section includes the following types of gypsum board construction:
 - 1. Impact resistance gypsum wallboard including screw-type metal support system.
 - 2. Sound Insulation.
 - 3. Drywall finishing (joint tape and compound treatment).
 - 4. Vinyl trim and accessories.
- C. Related Section(s):
 - 1. Section 09900 - Painting

1.3 QUALITY ASSURANCE

- A. Manufacturer: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.
- B. Single Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.
- C. Fireblocking and Draftstopping: Comply with the International Building Code requirements for installation of fireblocking and / or draftstopping, to prevent the fire passage of flame and product of combustion through concealed spaces or openings in gypsum board systems, in the event of fire.
- D. Provide self extinguishing vinyl trim accessories which do not support combustion once flame source is removed.

1.4 REFERENCES

- A. ANSI/ASTM C 840 Gypsum Board Standard - Comply with applicable requirements for application and finishing of gypsum board, unless otherwise indicated.
- B. ASTM C1396/C1396M Gypsum Wallboard (Standard, Type X, Flexible, Ceiling, Foil-Backed, Mold-Resistant)

- C. ASTM C1178/C1178M Standard for Glass Mat Water-Resistant Gypsum Backing Panel
- D. ASTM C754 Steel Framing Standard - Comply with applicable requirements for installation of steel framing for gypsum board)
- E. ASTM C11 Gypsum and Related Building Materials and Systems
- F. ASTM C1396/C1396M Impact Resistance Gypsum Wallboard and tested in accordance with ASTM C1629/C1629M
- G. ASTM D1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPCV) Compounds
- H. ASTM C475/C475M Joint Treatment Materials
- I. ASTM D3678 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Interior-Profile Extrusions
- J. ASTM C1047 Interior Trim
- K. Application and Finishing of Gypsum Panel Products: GA-216

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data as may be required to show compliance with these specifications.
 - 1. Provide product data for impact resistance gypsum wallboard system.
- B. Shop drawings: Submit shop drawings for structural heavy gauge wall studs supporting other equipment, items, cabinets, etc.
 - 1. Show layout, spacings, sizes, thicknesses, and types of metal framing, fabrication, fastening and anchorage details, including mechanical fasteners.
 - 2. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachments to other units of Work.
 - 3. Indicate manufacturer's design thickness to meet structural performance requirements for each wall mounted item, equipment, cabinet, etc.
- C. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand name and

identification of manufacturer or supplier.

- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
- C. Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.
 - 1. Minimum Room Temperatures: When ambient outdoor temperatures are below 55°F maintain continuous, comfortable building working temperature of not less than 55°F for 48 hours prior to application and continuously thereafter until drying is complete.
 - 2. Ventilate building spaces as required to remove water in excess of that required for drying joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.
 - 3. The gypsum drywall shall be installed only when the exterior walls alterations have been completed, doors installed and the roofing repairs are installed and in watertight condition to prevent the growth of mold. The contractor shall not install gypsum drywall panels that are wet, have the indication of mold, including but not limited to: fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
- B. Metal Support Systems:
 - 1. Allied Structural Industries
 - 2. Clark-Dietrich Building Systems
 - 3. National Gypsum Company
 - 4. Marino\WARE; a Div. of WARE Industries, Inc.
 - 5. United States Gypsum Co. (USG)
 - 6. Or approved equal.
- C. Gypsum Board Related Products:
 - 1. CertainTeed Gypsum.
 - 2. Georgia-Pacific Corp.
 - 3. Gold Bond Building Products Div., National Gypsum Co.

4. United States Gypsum Co.
5. Continental Building Products
6. Or approved equal.

D. Impact Resistance Gypsum Wallboard:

1. United States Gypsum Co. (USG)
2. National Gypsum Co.
3. Georgia-Pacific Gypsum, LLC
4. Continental Building Products
5. CertainTeed Gypsum.
6. Or approved equal.

E. Vinyl Trim

1. Trim-Tex,
2. Or approved equal.

2.2 METAL SUPPORT MATERIALS

A. General: Provide components which comply with ASTM C754 for materials and sizes, unless otherwise indicated.

B. Wall/Partition Support Materials

1. Studs ASTM C645, 25 gauge unless otherwise indicated. 20 gauge minimum at door jambs and wherever structural or other gauge studs are called for, for use with impact resistant type gypsum wallboard, and to comply with applicable published instructions and recommendations of gypsum board manufacturer or, if not available, of "Gypsum Construction Handbook" published by United States Gypsum Company.
 - a. Depth of Section: 3-5/8 inch, unless indicated otherwise.
 - b. Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.
 - c. Provide structural heavy gauge studs and bracing to support loads of wall mounted items, equipment, cabinets, etc. coordinate with other trades for weight requirements and mounting locations.
2. Fasteners for Stud Members: Provide fasteners of type, material, size, recommended by furring manufacturer for the substrate and application indicated.

2.3 GYPSUM BOARD

A. Impact Resistance, Gypsum Board: ASTM C1629, and as follows: (Paintable)

1. Thickness: 5/8 inch, unless otherwise indicated.
2. Complies with ASTM E84, Flame Spread 5, Smoke Developed 0 and Fire Resistance ASTM E119.
3. Mold resistant per ASTM D3273-00 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environment Chamber".

4. Edges: Manufacturer's standard.
5. Basis of Design: "Fiberock Abuse Resistant Interior Panels"; United States Gypsum Co.; or approved equal.

2.4 TRIM ACCESSORIES

- A. General: Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim beads, J-type edge trim beads, special L-kerf type edge trim beads, and one-piece control joint beads.
- B. Semi-Finishing Type: Manufacturer's standard trim units which are not to be finished with joint compound (non-beaded), where indicated.

2.5 JOINT TREATMENT MATERIALS (GYPSUM BOARD APPLICATION)

- A. General: Provide materials complying with ASTM C475, ASTM C840, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.
- B. Joint Tape: Manufacturer's recommended types for indicated applications. Use types compatible with joint compounds.
- C. Joint Compounds: Provide manufacturer's recommended types for indicated applications.
 1. For interior repair and patching work, provide chemical-hardening-type for bedding and filling, ready-mixed vinyl type or vinyl type powder type for topping.

2.6 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and the recommendations of the manufacturer of the gypsum board.
- B. Gypsum Board Screws: ASTM C954 or ASTM C1002.
- C. Acoustical Sealant: Water base type, non-drying, non-bleeding, non-staining type; permanently elastic, as recommended by gypsum board manufacturer.
 1. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant, [with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
 2. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), recommended for sealing interior concealed joints to reduce airborne sound transmission.

2.7 SOUND ATTENUATION BLANKETS

- A. Products shall be in accordance with ASTM C665-84, Type I semi-rigid unfaced mineral fiber blanket, Class 25 flame spread, thickness as indicated, and/or to achieve a minimum of STC 50 rating for indicated assemblies.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL SUPPORT SYSTEMS

- A. Do not bridge building expansion and control joints with steel framing or furring members; independently frame both sides of joints with framing or furring members or as indicated.
- B. Provide shims as required to install new work over existing substrates so that new work will be installed plumb, level and true.
- C. Wall-Partition Support Systems:
 - 1. Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, furnishings, and similar work to comply with details indicated or, if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer or, if not available, of "Gypsum Construction Handbook" published by United States Gypsum Company.
 - 2. Isolate non-load bearing steel stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
 - a. Install single deep-leg deflection tracks and anchor to building structure.
 - b. Connect drift clips to cold-formed metal framing and anchor to building structure.
 - 3. Install runners tracks at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other work, except as otherwise indicated. Ramset to precast plank.
 - 4. Extend partition stud system through acoustical ceilings and elsewhere as indicated to the structural support and substrate above the ceiling.
 - 5. Frame door openings with vertical studs securely attached by screws at each jamb either directly to frames or to jamb anchor clips on door frame; install runner track sections (for jack studs) at head and secure to jamb studs.
 - 6. Space studs 16 inches o.c. except as otherwise indicated.

7. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
8. Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.
9. Provide runner tracks of same gauge as jamb studs. Space jack studs same as partition studs.
10. Cut studs 1/2" short of full height to provide perimeter relief.
11. Do not fasten studs to top track to allow independent movement of studs and track.
12. Door jambs:
 - a. Install double 20 gauge studs at each jamb for all doors.
 - b. Space wall furring members 16 inches o.c. except as otherwise indicated.

3.3 APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL

- A. Pre-Installation Conference: Meet at the project site with the installers of related work and review the coordination and sequencing of work to ensure that everything to be concealed by gypsum drywall has been accomplished, and that chases, access panels, openings, supplementary framing and blocking and similar provisions have been completed.
- B. Install sound attenuation blankets at all partitions prior to gypsum board unless readily installed after board has been installed.
- C. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.
- D. Install wall/partition boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible.
- E. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.
- F. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
- G. Attach gypsum board to framing and blocking provided for additional support at openings and cutouts.
- H. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.)

- I. Form control joints and expansion joints at locations indicated (@ 30'-0" o.c. or 900 sf), with space between edges of boards, prepared to receive trim accessories.
- J. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4 inch to 1/2 inch space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant.
- K. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum board over wood framing, with "floating" internal corner construction.
- L. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.4 METHODS OF GYPSUM BOARD APPLICATION

- A. Single-Layer Application: Install gypsum wallboard as follows:
 - 1. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated, and provide sheet lengths which will minimize end joints.

3.5 INSTALLATION OF DRYWALL TRIM ACCESSORIES

- A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.
- B. Install corner beads at external corners.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound. Install "L" type trim where drywall construction is tightly abutted to other construction and install special kerfed type where other work is kerfed to receive long leg of "L" type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).
 - 1. Install J-type semi-finishing trim where indicated, and where exterior gypsum board edges are not covered by applied moldings.
- D. Install metal control joint (beaded type) where indicated or required.

3.6 FINISHING OF DRYWALL

- A. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.
- B. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.
- C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

- D. Apply joint compounds in 3 coats (not including prefill of openings in base), and sand between last 2 coats and after last coat.
- E. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C11, ASTM C 840 and GA-216:
 - 1. **Level 1:** All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. In plenum areas above the ceiling, attics, areas concealed in the building (does not typically meet fire-resistant assembly requirements).
 - 2. **Level 5:** All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, applied to the entire surface. The surface shall be free of tool marks and ridges. Finish for areas that are to receive gloss, semi-gloss, enamel or non-textured flat paints.

3.7 IMPACT RESISTANCE GYPSUM WALLBOARD INSTALLATION

- A. General: Install fiber reinforced gypsum wallboard according to manufacturer's instructions and GA-216 "Application and Finishing of Gypsum Board."
 - 1. Nails and Screws: Corrosion resistant; ASTM C 840.
 - 2. Adhesives: Manufacturer's approved adhesive types.
 - 3. Accessories: Similar to indicated gypsum wallboard application.
 - 4. Joint Tape, Taping Compound and Finishing Compound: Comply with ASTM C 475.

3.8 CLEANING AND PROTECTION

- A. Remove temporary coverings used to protect other work.
- B. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction being without damage or deterioration at time of Substantial Completion.

END OF SECTION 09250

SECTION 09510 - ACOUSTICAL CEILINGS

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. Extent of type of acoustical ceiling is shown and scheduled on the drawings.
- B. Type of acoustical ceilings specified in this section includes the following:
 - 1. Lay in acoustical ceiling board, exposed suspension system.

1.3 QUALITY ASSURANCE

- A. Installer: Firm with a recommended three years of successful experience in installation of acoustical ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer.
- B. Fire Resistance Ratings: As indicated by reference to design designation in UL "Fire Resistance Directory" for floor, roof or beam assemblies in which acoustical ceilings function as a fire protective membrane; tested per ASTM E 119. Provide protection materials for lighting fixtures and air ducts to comply with requirements indicated for rated assembly.
- C. Surface Burning Characteristics: As follows, tested per ASTM E 84.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 50 or less.
- D. All acoustical ceilings shall be installed to conform to the requirements of International Building Code for Category C and the recommendation of the Ceiling and Interior Systems Construction Association (CISCA) for Zone 2 seismic design and comply with installation requirements for areas subject to light to moderate seismic activity.
- E. General Contractor shall provide adequate ventilation and humidity control before, during and after ceiling installation to prevent damage (sagging, etc.) to ceilings prior to Owner's acceptance of building.
- F. Warranty:
 - 1. Provide manufacturer's special project warranty against sagging or warping of acoustic ceiling boards for a minimum period of **thirty (30) years** which starts on approved date of substantial completion.
- G. Unless otherwise approved by the Architect, all Acoustical Ceiling Board types and Suspended Grid System types shall be by a single manufacturer.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required including certified test reports to show compliance with requirements of these specifications.
 - 1. Include manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods which may be detrimental to finishes and acoustical performance.
- B. Samples: Submit manufacturer's standard size samples of acoustical units, but not less than 6" square, and of exposed ceiling suspension members including wall and special moldings. Provide samples showing full range of colors, textures and patterns available for each type of component required.
- C. Shop Drawings: Submit shop drawings for acoustical ceilings, including layout of system components and details of connections between elements of system and between system and other building components.
 - 1. **Contractor must provide shop drawings certifying that attachment devices meet specified loads. Contractor must coordinate with all Subcontractors for fixture loads, etc.**
- D. Testing Reports: Submit testing reports which indicate compliance with indicated requirements.
- E. Deliver extra materials to Owner. Furnish extra materials described below matching products installed, packaged with protective covering for storage and identified with appropriate labels.
 - 1. Acoustical Ceiling Units: Furnish quantity of full size units equal to 2.0% (rounded up to the nearest full carton) of each type of acoustic unit installed.
 - 2. Exposed Suspension System Components: Furnish quantity of each exposed component equal to 2.0% (rounded up to the nearest full carton) of each type suspension component installed.

1.5 PROJECT CONDITIONS

- A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Provide Acoustical Ceiling Board (ACB) and Metal Suspension System as manufactured by Armstrong World Industries; United States Gypsum Co.; CertainTeed Ceilings; or approved equal.

- B. Acoustical Ceiling Tile and Grid system products specified herein have been selected because of their quality of construction, configuration, design, function, available finishes, components, accessories, dimensions, shape and style.
1. Comparable products of the following manufacturers will be considered if it can be clearly shown that their products are equal to or will exceed the construction quality requirements and other design attributes listed as performance of the "Basis of Design" Systems.
 - a. USG Corporation,
 - b. CertainTeed Ceilings.
 - c. Rockfon, LLC,
 - d. Or approved equal.
 2. The use of one manufacturer's catalog numbers, and the specific requirements set forth in drawings and specifications, are not intended to preclude the use of other manufacturer's products or procedures which may be equivalent, but are given for the purpose of establishing a standard of design and quality for materials, construction and workmanship.
- C. Substitute products will be considered for substitution only when submitted to the Architect as per the requirements of AIA A201 and Section 00800.

2.2 ACOUSTICAL CEILING BOARDS

- A. Refer to reflected ceiling plans for sizes and locations.
- B. Where ACB-1 is indicated: 24" x 48" x 7/8" thick, square edge, NRC .80; CAC 35 light reflectance 87%, sag resistance; Humiguard Plus Performance. Armstrong Ultima High NRC (Item# 1943); equivalent from USG, CertainTeed; or approved equal. [Unperforated]

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Standard for Metal Suspension Systems: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C 635 requirements.
- B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated. For exposed suspension members and accessories with painted finish, provide color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's full range of standard colors.
- C. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung.
- D. Concrete Inserts: Inserts formed from hot-dipped galvanized sheet steel and designed for attachment to concrete forms and for embedment in concrete, with holes or loops for attachment at hanger wires.
- E. Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, prestretched, Class 1 coating, sized so that stress at 3-times hanger design load (ASTM C 635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12gage (0.106").

- F. Type of System: Either direct-hung or indirect-hung suspension system, at Contractor's option.
 - 1. Carrying Channels: 1-1/2 inch steel channels, hot-rolled or cold-rolled, not less than 0.475 lbs. per lineal foot.
- G. Edge Moldings and Trim: Metal types and profiles indicated or, if not indicated, provide manufacturer's standard molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated. Provide 7/8" edge at wall angle and reveal edges.
- H. Hold-Down Clips: For interior ceilings composed of lay-in panels weighing less than 1 lb. per sq. ft., or where indicated, provide hold-down clips spaced 2'-0" o.c. on all cross tees.

2.4 EXPOSED METAL SUSPENSION SYSTEMS

- A. Double Web Steel Suspension System: For use where ACB ceilings are indicated. Manufacturer's standard system roll-formed from prefinished hot dipped galvanized steel with 15/16" wide exposed faces on flanges of structural members; other characteristics as follows:
 - 1. Structural Classification: Intermediate-Duty System.
 - 2. Finish: Painted in color as selected by Architect.
 - 3. Basis of Design: Armstrong World Industries "Prelude XL Exposed Tee System"; USG "Donn Brand DX", CertainTeed 15/16" Classic Stab; or approved equal.

2.5 MISCELLANEOUS MATERIALS

- A. Acoustical Sealant: Resilient, non-staining, non-shrinking, non-hardening, non-skinning, non-drying, non-sag sealant intended for interior sealing of concealed construction joints.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine conditions under which acoustical ceiling work is to be performed and notify Architect in writing of unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 PREPARATION

- A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.
- B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.

3.3 INSTALLATION

- A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire-resistance rating requirements as indicated, and CISCA standards applicable to work.
- B. Arrange acoustical units and orient directionally-patterned units (if any) in manner shown by reflected ceiling plans.
 - 1. Install tile with pattern running in one direction, unless otherwise indicated.
- C. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers not less than 6" from each end and spaced 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".
 - 1. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.
- D. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.
 - 1. Sealant Bed: Apply continuous ribbon of acoustical sealant, concealed on back of vertical leg before installing moldings.
 - 2. Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0". Miter corners accurately and connect securely.
 - 3. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.
 - 4. Install hold-down clips in areas indicated, and in areas where required by governing regulations or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.
- E. Cooperate with other trades and Contractors for installation of their materials and equipment, particularly with those installing the ductwork, ceiling diffusers and lighting fixtures so that diffusers, lighting fixtures and other items are located on center lines of tile or on centers of joints as shown on approved shop drawings.
 - 1. Provide additional hanger wires to support cubicle curtain tracks, and other superimposed loads. Locate the supplemental hangers within 6 inches of each corner of the item being supported.
 - 2. Where light fixtures, or other recessed items occur in ceilings, frame acoustical material properly to permit installation of such recessed items and do all necessary cutting and fitting of acoustical materials and suspension systems to accommodate same. Cut neatly around all pipes passing through ceilings. Build in fixture frames and yokes in cooperation with Electrical Contractor.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage. General Contractor is responsible for cleaning or replacement of all damaged tile, regardless of how the damage was caused and regardless of by which Contractor.

END OF SECTION 09510

SECTION 09650 - RESILIENT FLOORING

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 DESCRIPTION OF WORK

- A. Extent of resilient flooring and accessories is shown on drawings and in schedules.
 - 1. Vinyl composition tile (VCT).
 - 2. Static dissipative vinyl composition tile (SDT).
 - 3. Rubber resilient wall base.
 - 4. Resilient edge strips.

1.3 RELATED SECTIONS

- A. Section 01455 - Concrete In-situ Relative Humidity and pH Testing.
- B. Section 03300 - Cast in Place Concrete Slabs on Grade.
- C. Section 03450 - Self-Drying Finishing Underlayment.
- D. Section 07900 - Joint Sealer Assemblies.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
 - 1. ASTM F 2170-11 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
 - 2. ASTM F 1869-11 Standard Test Method Using Anhydrous Calcium Chloride.
 - 3. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - 4. ASTM F 1861 Type TS, Group 1 Performance Requirements for Resilient Rubber Wall Base.
 - 5. ASTM F 137 Standard Test Method for Flexibility of Resilient Flooring Materials protocol for Resilient Rubber Wall Base.
 - 6. ASTM F 1515 Standard Test Method for Measuring Light Stability of Resilient Flooring protocols for Resilient Rubber Wall Base.
 - 7. ASTM D 2240 Not less than 85 Shore A.

8. ASTM D 3389 Abrasion Resistance: less than 1 gram weight loss.
 9. ASTM D 2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring of 0.6 or greater.
 10. ASTM E 648 Standard Test Method for Critical Radiant Flux of 0.45 watts/cm² or greater, Class I.
- B. Moisture vapor emission testing in accordance with ASTM F 1869-11. Test results should not exceed 3 pounds per 1,000 square feet per 24 hours, unless otherwise specified by the flooring or adhesive manufacturer.
1. ASTM Standard also states that relative humidity inside of the concrete slab should not exceed 75%, per ASTM F2170-11, unless otherwise specified by the flooring or adhesive manufacturer.
- C. Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.
1. Wherever possible, provide each type of required resilient flooring and accessories produced by a single manufacturer.
- D. Fire Test Performance: Provide resilient flooring which complies with the following fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.
1. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, Class A, Smoke <450.
 2. ASTM E648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm² or greater, Class 1.
- E. Coefficient of Friction: The Federal and industry standard for testing coefficient of friction or the slip resistance of a surface is tested to the requirements, as outlined, in ASTM D-2047, which utilizes a friction measurement machine, commonly referred to as the James Machine.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of resilient flooring and accessory.
- B. Samples for Verification Purposes: Submit the following samples in triplicate of each type, color, and pattern of resilient flooring required, showing full-range of color and pattern variations.
1. Full size tile samples.
 2. For initial selection of colors and patterns submit, prior to above, samples in form of actual sections of resilient flooring, including accessories, showing full range of colors and patterns available, for each type of resilient flooring required.

- C. Certification for Fire Test Performance: Submit certification from an independent testing laboratory acceptable to authorities having jurisdiction that resilient flooring complies with fire test performance requirements.
- D. Testing of Substrate:
 - 1. Submit test reports of testing the concrete or other floor substrate, indicating compliance with manufacturer's requirements for moisture and alkalinity percentage of contents. Tests shall be performed in accordance with requirements of Section 01455.
- E. Maintenance Instructions: Submit 2 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.
- F. Replacement Material: After completion of work, deliver to project site replacement materials from same manufactured lot as materials installed, and as follows:
 - 1. Tile flooring, not less than one box for each 50 boxes or fraction thereof, for each type, size and color installed.

1.6 PROJECT CONDITIONS

- A. Maintain minimum temperature of 65°F (18°C) or more than 85°F (29°C) in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation.
 - 1. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation.
- B. Maintain the ambient relative humidity between 40% and 60% during installation.
- C. Install resilient flooring and accessories after other finishing operations, including painting, have been completed.
- D. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55°F (13°C) or more than 85°F (29°C).
- E. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by resilient flooring manufacturers and their recommendation for bond and maximum levels of moisture and pH per testing as performed under requirements of Section 01455.

1.7 WARRANTY

- A. Vinyl Composition Tile (VCT):
 - 1. Manufacturer warrants its regular (first quality) commercial floor products to be free from manufacturing defects for **five (5) years** from date of purchase.
 - a) **Within One(1) Year** of Purchase: If a defect covered by this warranty is reported to Manufacturer in writing within one(1) year of purchase, Manufacturer will replace/repair at its discretion the defective product including reasonable labor

charges for installation. Manufacturer will replace it with similar quality first grade material or repair the defect. The replaced or repaired material is warranted for the time then remaining under this original Warranty.

- b. **Within Two(2) Years** of Purchase: If a defect covered by this warranty is reported to Manufacturer in writing within two(2) years of purchase, Manufacturer will replace or repair at its discretion the defective product and pay 50% of a reasonable labor charge for installation.
- c. **After Two(2) Years** of Purchase: If a defect covered by this warranty is reported to Manufacturer in writing after two(2) years but within ten(10) years of purchase, Manufacturer will replace or repair at its discretion defective material only (excluding cost of installation).
- d. Otherwise: **Within Five(5) Years** of Purchase: Installation is not according to Manufacturer's Engineered Installation Systems. If a defect covered by this warranty is reported to Manufacturer in writing within five(5) years of purchase, Manufacturer will replace or repair at its discretion defective material only (excluding cost of installation).
- e. Manufacturer does not warrant the installers' workmanship. Workmanship errors should be addressed to the contractor who installed the floor.

B. Static Dissipative Vinyl Composition Tile Flooring (SDT)

1. Warranty: Manufacturer's standard for material and labor:
 - a. A minimum of **One (1) year** for labor and material. Warranty period shall start from approved date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but not limited to the following:
 1. Vinyl Composition Tile (VCT); provide the following:
 - a. Standard Excelon Imperial Texture and Standard Excelon MultiColor, as manufactured by Armstrong World Industries;
 - b. Essentials, Designer Essential and Inspiration, as manufactured by Mannington Commercial;
 - c. Or approved equal.
 2. Manufacturers of Static Dissipative Vinyl Composition (SDT):
 - a. Static Dissipative Tile SDT, as manufactured by Armstrong World Industries";
 - b. Granit SD, as manufactured by Johnsonite (a Tarkett Co., Azrock Collection);
 - c. Static Dissipative ESD, as manufactured by Roppe;
 - d. Or approved equal.
 3. Rubber Resilient Wall Base and Accessories:
 - a. Pinnacle, as manufactured by Roppe Corporation;
 - b. BaseWorks Thermoset Rubber Wall Base, as manufactured by Johnsonite,
 - c. RubberMyte, as manufactured by Burke Mercer Flooring Product,
 - d. Equivalent by Mohawk,
 - e. Or approved equal.

- B. Products specified herein have been selected because of their quality of construction, configuration, design, function, available finishes, components, accessories, dimensions, shape and style.
 - 1. The use of one manufacturer's catalog numbers, and the specific requirements set forth in drawings and specifications, are not intended to preclude the use of other products by other manufacturer's or which may be equivalent, but are given for the purpose of establishing a standard of design and quality for materials, construction and workmanship.
- C. Comparable products of other manufacturers will be considered if it can be clearly shown that their products are equal to or will exceed the construction quality requirements, intended performances and all other design attributes listed above and provided that deviations in dimensions and profiles are minor and do not materially detract from the design concept or intended performances as judged solely by the Architect/Owner.

2.2 VINYL COMPOSITION TILE FLOORING

- A. Vinyl Composition Tile: ASTM F 1066, Class 2, through pattern, 12" x 12" unless otherwise indicated, and as follows:
 - 1. Asbestos-free.
 - 2. Gauge: 1/8 inch.
- B. Provide vinyl composition tile to meet indicated "Basis of Design" products and quality assurance requirements indicated in Articles 1.2 and 2.1 of this specifications.

2.3 STATIC DISSIPATIVE VINYL COMPOSITION TILE FLOORING (SDT)

- A. Provide products in compliance with ASTM F1066 - Class 2 through pattern, Class 1 Flame Spread as per ASTM E648, Static Generation per ANSI/ESD STM 97.2 at 12% R.H., Static Dissipation per ETS Dissipation Method at 12% R.H., 12" x 12" tile with minimum slip resistance as per ASTM D 2047 / UL 410, and as follows:
 - 1. Asbestos-free.
 - 2. Gauge: 1/8 inch.
 - 3. Colors: As selected by the Architect from manufacturer's available full range of colors.
 - 4. Provide manufacturer's approved adhesive.

2.4 ACCESSORIES

- A. Stair Nosing: Provide flexible vinyl stair nosings with a 2" wide co-extruded strip of contrasting color at the nose of the product for the visually impaired.
 - 1. Color: As selected by Architect from manufacturer's available full range of colors.
- B. Wall Base: Provide rubber base complying with ASTM F-1861, Type TS, Group 1. Vulcanized SBR rubber with matching preformed corner units, and as follows:
 - 1. Height: 4-inches, unless otherwise indicated on the drawings.

2. Thickness: 1/8 inch gauge.
 3. Style: Standard top-set cove.
 4. Finish / Colors: Matte finishes in colors as selected by Architect from manufacturer's available full range of colors. Allow for more than one color in any given area.
 5. Color Stability: Meets or exceeds ASTM F 1861 requirements for color stability when tested to ASTM F 1515 Standard Test Method for Measuring Light Stability of Resilient Flooring protocols.
 6. Phthalate, chlorine and halogen free.
- B. Resilient Edge Strips: 1/8" thick, homogeneous vinyl or rubber composition, tapered or bullnose edge, color to match flooring, or as selected by Architect from manufacturer's available full range of colors; not less than 1" wide.
- C. Adhesives (Cements): Water resistant, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.
1. Adhesives to be used for resilient floor applications shall not generate any odor or unpleasant smell.
- D. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- E. Leveling and Patching Compounds: Latex types as recommended by flooring manufacturer.
- F. Slip Retardant Polish: Provide slip-retardant polish as recommended by resilient tile manufacturer.
1. POLISH FOR RESILIENT FLOORING
 - a. Floor Polish: Contractor shall provide floor polish to achieve the Static Coefficient of Friction; per ASTM D 2047, of 0.5 or better for level surfaces and as per requirements of state and local codes having jurisdictions.

2.5 COLORS, TEXTURES AND PATTERNS

- A. Colors, textures and patterns shall be as selected and directed by the Architect. Patterns shall be defined as using not more than five (5) different colors of tile in any given area, applied in borders, stripes, diagonals, checkerboard patterns and other designs as indicated, or if not indicated, shall be as directed by the Architect.
1. All selections shall be made from manufacturer's full product lines, for all products and accessories, (including premium textures and colors).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Inspect substrates and conditions of installation to verify that work may properly commence. Do not proceed with the work until unsatisfactory conditions have been corrected.

- B. Concrete Substrates: Perform concrete relative humidity and pH testing and to comply with manufacturer's recommended moisture tests before beginning installation, to verify that concrete surfaces have cured sufficiently to allow adhesive bond to resilient flooring.
 - 1. Commencement of work shall constitute acceptance of conditions. Any necessary remedial work required to correct any unsatisfactory conditions, found after the start of installation, will be provided at no cost to the Owner.

3.2 PREPARATION

- A. Perform moisture content testing as required by manufacturer's instructions to ensure pH readings and moisture transmission are acceptable. Perform testing in accordance with requirements of Section 01455.
 - 1. If values exceed this level, follow manufacturer's recommendations for moisture transmission mitigation. Do not proceed until unsatisfactory conditions have been corrected.
- B. Broom clean or vacuum surfaces to be covered, and inspect subfloor.
 - 1. Use leveling and patching compounds as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.
 - 2. Apply concrete slab primer and/or sealer, as recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.
 - 3. Remove paint, curing compounds, and other materials that could interfere with adhesion of resilient products.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with manufacturer's published recommendations for installation in each area, extending resilient flooring into spaces which are partially concealed. Cut and fit tightly to fixtures, pipes, and other obstructions, as well as to walls and partitions.
- B. Access Covers: Install resilient flooring tightly to removable access covers in field of flooring, taking care that pattern will match when covers are in closed position.
- C. Tightly adhere resilient flooring to substrate with no open joints or cracks, and without raised or blistered areas. Spread adhesive evenly, so that final installation will be without telegraphed markings from adhesive or substrate.
- D. Extend resilient flooring into toe spaces, door reveals, and into closets and similar openings.
- E. Scribe, cut, and fit resilient flooring to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.

- F. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.
- G. Install resilient flooring on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.
- H. Tightly cement resilient flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient flooring at perimeter of each covered area to assure adhesion.

3.4 INSTALLATION OF TILE FLOORS

- A. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room area of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.
- B. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable.
 - 1. Lay tile in pattern shown or as directed by Architect.
- C. Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.
- D. Expansion Joints: Locate expansion joints and other sealant filled joints, including control, contraction and isolation joints, where indicated or where joints occur in substrate. Do not saw cut joints.

3.5 INSTALLATION OF ACCESSORIES

- A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
 - 1. Job-formed Corners:
 - a. Outside Corners: Form by bending without producing discoloration (whitening) at bends.
 - b. Inside Corners: Butt one piece to corner, then scribe next piece to fit.
- B. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- C. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

- D. Apply resilient accessories to stairs as indicated and in strict accordance with manufacturer's installation instructions.

3.6 CLEANING AND PROTECTION

- A. Perform following operations immediately upon completion of resilient flooring:
 - 1. Sweep or vacuum floor thoroughly.
 - 2. Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well-sealed in adhesive.
 - 3. Damp-mop floor being careful to remove black marks and excessive soil.
 - 4. Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturers.
- B. Protect flooring against damage during construction period to comply with resilient flooring manufacturer's directions.
 - 1. Apply protective floor polish to resilient flooring surfaces free from soil, excess adhesive or surface blemishes. Use commercially available metal cross-linked acrylic product acceptable to resilient flooring manufacturer.
 - 2. Protect resilient flooring against damage from rolling loads for initial period following installation by covering with plywood or hardboard. Use dollies to move stationary equipment or furnishings across floors.
 - 3. Cover resilient flooring with undyed, untreated building paper until inspection for substantial completion.
- C. Clean resilient flooring not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Clean resilient flooring by method recommended by resilient flooring manufacturer.
- D. Strip protective floor polish, which was applied after completion of installation, prior to cleaning.
 - 1. Reapply floor polish after cleaning.

3.7 EXTRA STOCK

- A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
 - 1. Tile Flooring: Furnish not less than one box for each 50 boxes or fraction thereof, for each type, color, pattern and size selected and installed.
 - 2. Accessories: Furnish not less than 2% of each type, size and color selected and installed.

END OF SECTION 09650

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SECTION 09900 - PAINTING

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.
- B. Related Section(s):
 - 1. Section 04200 - Unit Masonry.
 - 2. Section 05400 - Miscellaneous Structural Steel.
 - 3. Section 05500 - Metal Fabrications.
 - 4. Section 08110 - Hollow Metalwork.
 - 5. Section 08211 - Wood Doors for light frames.
 - 6. Section 09250 - Gypsum Drywall.
 - 7. Division 15 - Mechanical Work.
 - 8. Division 16 - Electrical Work.

1.2 DESCRIPTION OF WORK

- A. Extent of painting work is indicated on drawings and schedules, and as herein specified.
- B. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated.
 - 1. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
- C. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- D. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finishes available.
- E. Following categories of work are not included as part of field-applied finish work.
 - 1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, steel windows, miscellaneous metal, hollow metal work, and similar items. Also, for fabricated components such as architectural woodwork, wood casework, and shop fabricated or factory built mechanical and electrical equipment or accessories. This is in addition to the prime coat specified herein.
 - 2. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to)

metal toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, and shop fabricated or factory built mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.

3. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
 4. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
 5. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting.
 6. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment, identification, performance rating, name, or nomenclature plates.
- F. Mechanical and Electrical Work: Painting of mechanical and electrical work is specified herein.
1. Painting of mechanical and electrical work is limited to those items exposed to view.
 2. Mechanical items to be painted include, but are not limited to, the following:
 - a. Piping, pipe hangers and supports.
 - b. Ductwork, insulation.
 - c. Access doors and service panels.
 3. Electrical items to be painted include, but are not limited to, the following:
 - a. Conduit and fittings.
 - b. Backboxes.
 - c. Junction boxes.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.
- B. Coordination of Work: Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.
- C. Industry Standards: Comply with industry standard established by the Painting and Decorating Contractors of America PDCA for applications, methods and recommendations and use of tools and equipment for paint and stain coatings, primers and block fillers.

D. Lead and Chromate Contents:

1. All paint products must be free of any lead or chromate contents.

E. Volatile Organic Compound Compliant (VOC.):

1. All paint products must meet the State VOC environmental regulations (OTC Regulation compliant) and the following:
 - a. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
 - (1) Primer, Sealer and Undercoater: VOC content of not more than 200 g/L.
 - (2) Specialty Primer, Sealer and Undercoater: VOC content of not more than 350 g/L.
 - (3) Rust Preventative Coating: VOC content of not more than 400 g/L.
 - (4) Flat Paints and Coatings: VOC content of not more than 100 g/L.
 - (5) Non-Flat Paints and Coatings: VOC content of not more than 150 g/L.
 - (6) Nonflat High Gloss Coatings: VOC content of not more than 250 g/L.
 - (7) Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

G. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials proposed for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

1. At galvanized surfaces, primer shall be a zinc dust-zinc oxide coating.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.
- B. Samples: Prior to beginning work, Contractor shall furnish color chips (2 fan decks) for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.
 1. On 12" x 12" hardboard, provide two samples of each color and material, with texture to simulate actual conditions. Resubmit samples as requested by Architect until acceptable sheen, color, and texture is achieved.
- C. Acknowledgment of Contract Documents: Contractor/ Installer shall submit to the Architect certifications signed by each of the Contractor and Installer attesting acknowledgment of requirements of the Contract Documents for specific project requirements indicated in this specifications.

1. Installer shall submit proof of evidence, (this project specification section) with his/her letter of certificate.
 2. Contractor / Installer shall not proceed with painting work of this section until submittal of required certifications are completed.
 3. Any work performed prior to completion of this submittal shall be subject to total rejection by the Architect. All rejected work shall be rectified without any additional cost to the Owner.
- D. Coating Maintenance Manual: Upon conclusion of the project, the contractor in conjunction with the coating manufacturer shall furnish a coating maintenance manual such as the 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, SDS pages, care and cleaning instructions, touch up procedures and color samples of each color and finish used.

1.5 DELIVERY AND STORAGE

- A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
1. Name or title of material.
 2. Fed. Spec. number, if applicable.
 3. Manufacturer's stock number and date of manufacturer.
 4. Manufacturer's name.
 5. Contents by volume, for major pigment and vehicle constituents.
 6. Thinning instructions.
 7. Application instructions.
 8. Color name and number.

1.6 JOB CONDITIONS

- A. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45°F (7°C) and 95°F (35°C), unless otherwise permitted by paint manufacturer's printed instructions.
- B. Do not apply paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.
- C. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.
- D. Provide sufficient temporary illumination producing overall space/room minimum illumination level of 50 ft. candles while preparing or painting of surfaces and to assure the production of quality finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but are not limited to the following:
 - 1. Benjamin Moore
 - 2. PPG Architectural Coatings
 - 3. The Sherwin-Williams Company
 - 4. Linetec Inc.
 - 5. Or approved equal

2.2 COLORS AND FINISHES

- A. Prior to beginning work, Contractor shall furnish color chips for surfaces to be painted from manufacturers full line of products. This shall include custom colors.
 - 1. Contractor shall allow for a total of 20 different colors of each type of paint, (excluding graphics and /or art work as indicated) with change of color within a room or space occurring either on a horizontal or vertical line, [allow for multiple (6) colors at each room unless otherwise shown]. Where roof structure is exposed, steel beams, steel joists and metal decking will be painted with different colors, as selected by the Architect.
 - 2. Contractor shall allow for split frames at all new and existing hollow metal door and borrowed lite frames to be painted.
 - 3. Final acceptance of colors will be from samples supplied on the job.
- B. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

2.3 MATERIALS

- A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
- B. Provide undercoat paint recommended and produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only within recommended limits.

2.4 EXTERIOR PAINT SCHEDULE

- A. Basis of Design: Provide the following paint systems for the various substrates, or approved equal manufacturer / system:
- B. Semi-Gloss Enamel (Waterbased Alkyd Urethane Enamel Finish)
 - 1. 1st Coat: Sherwin-Williams, Extreme Bond Exterior Primer.

2. 2nd Coat: Sherwin-Williams, Pro Industrial Waterbased Alkyd Urethane.
3. 3rd Coat: Sherwin-Williams, Pro Industrial Waterbased Alkyd Urethane.
4. Apply to the following exterior surfaces: Lintels, ferrous metal, and other exterior assemblies to receive paint.
5. Apply as many coats as necessary to produce a uniform substrate and finish appearance.

2.5 INTERIOR PAINT SCHEDULE

A. Semi-Gloss (Satin) Enamel:

1. 1st Coat: Sherwin-Williams, Pro Industrial Pro-Cryl Universal Primer.
2. 2nd Coat: Acrylic Enamel, Sherwin-Williams, Pro Industrial HP Acrylic.
3. 3rd Coat: Acrylic Enamel, Sherwin-Williams, Pro Industrial HP Acrylic.
4. Apply to following interior surfaces: Hollow metal work, metal lites for wood doors, miscellaneous steel and ferrous metal fabrications.
5. Apply as many coats as necessary to produce a uniform substrate and finish appearance.

B. Egg-Shell / Satin Enamel - Acrylic Latex:

1. Base Coats: Enamel Undercoat; Primer-Sealer to suit substrate or Loxon Block Surfacer for Concrete Masonry/CMU Block.
 - * Block Filler shall be Level 3 - Premium Fill; one or multiple coats for high performance block filler in accordance with PDCA industry standards. Apply mock-up to confirm appearance before application of finish coats.
2. 2nd Coat: Sherwin-Williams, ProMar 200 Zero VOC Eg-Shel.
3. 3rd Coat: Sherwin-Williams, ProMar 200 Zero VOC Eg-Shel.
4. Apply to the following interior surfaces: Concrete masonry units, gypsum drywall and other interior assemblies to receive paint.
5. Apply as many coats as necessary to produce a uniform substrate and finish appearance.

C. Flat - Acrylic Latex:

1. 1st Coat: Sherwin Williams ProMar 200 Zero VOC Interior Latex Primer.
2. 2nd Coat: Sherwin Williams, ProMar 200 Zero VOC Flat Interior Latex Flat.

3. 3rd Coat: Sherwin Williams, ProMar 200 Zero VOC Flat Interior Latex Flat.
4. Apply to following interior surfaces: Interior surfaces of ducts, where visible through registers or grilles, etc.
5. Apply as many coats as necessary to produce a uniform substrate and finish appearance.

2.6 EXTRA STOCK

- A. Contractor shall provide one gallon of extra stock for each color/type selected for use on the project. Provide unopened containers clearly marked with manufacturers color number and name.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions, included rotted or otherwise defective materials, have been observed by all concerned and corrected in a manner acceptable to Applicator.
- B. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
- C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.2 SURFACE PREPARATION

- A. General:
 1. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
 2. Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
 3. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
 4. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

5. Painting of materials shall commence only when the moisture content of the materials complies with manufacturer's recommendations as follows:
 - a. Masonry - 22% maximum.
 - b. Gypsum drywall - 12% maximum.
- B. Cementitious Materials:
 1. Prepare cementitious surfaces of concrete block, cement plaster and gypsum drywall board to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.
 2. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
- C. Ferrous Metals:
 1. Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
 2. Touch-up shop-applied prime coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.
 3. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent.

3.3 MATERIALS PREPARATION

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
- D. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.4 APPLICATION

- A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. Where finish schedule calls for walls to be painted, paint all new and existing surfaces in same area. Paint from corner to corner on walls or to a major change in direction of surface

to be painted. Provide crisp, clean, sharp lines where new painted surfaces abut existing painted surfaces.

- C. **Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.**
- D. **Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.**
- E. Sand lightly between each succeeding enamel coat.
- F. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
- G. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- H. **Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as recommended by coating manufacturer and an acceptable finished appearance in finish, color and appearance as determined by the Architect.**
- I. Primer Coat: Apply primer coat of material which is required to be painted or finished, and which has not been prime coated by others.
 - 1. **Re-coat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.**
- J. **Block Fillers: Apply block fillers using manufacturer's recommended application techniques with sufficient material and coats to achieve a pinhole-free, "Level 3 - Premium Fill Surface", and in accordance with PDCA 's industry standards.**
- K. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
- L. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.5 CLEAN-UP AND PROTECTION

- A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.

- B. Upon completion of painting work, clean all paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

- C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
 - 1. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

 - 2. At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION 09900

SECTION 10100 - DRY MARKERBOARDS AND EXHIBITION BOARDS

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 DESCRIPTION OF WORK

- A. Extent of dry markerboards and exhibition boards is indicated on the drawings.
- B. Type of dry markerboards and exhibition boards specified in this section includes the following:
 - 1. Porcelain enamel steel dry marker boards.
 - 2. Fabriccork fabric faced cork exhibition boards.
 - 3. Factory applied trim.
 - 4. Magnetic markerboard tray(s).

1.3 REFERENCES

- A. ASTM E84 Standard Test Method for Surface Burning Characteristics for Building Materials.
- B. ASTM C540 Gloss for ceramic materials.
- C. ASTM C614 for alkali resistance.
- D. ASTM D2244 evaluation of color differences.
- E. ASTM B221 Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.
- F. ASTM C208-72 for cellulosic fiberboard.
- G. ANSI A208.1-79 for particleboard.
- H. ANSI H35.1-82 for aluminum temper and alloy.
- I. HNSI A424-80 for steel for porcelain enameling.
- J. FS LLL-B-810 for tempered hardboard.
- K. PEI-1002 Manual and Performance Specification for Porcelain Enamel Writing Surfaces.

- L. BYK-Gardner Surface Distortion.
- M. GREENGUARD Indoor Air Quality Certified.
- N. GREENGUARD Children and Schools Indoor Air Quality Certified.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Furnish all dry markerboards and exhibition boards by a single manufacturer for the entire project.
- B. Surface Burning Characteristics: Provide exhibition board surfaces which are identical in composition to those with surface burning characteristics indicated below, as determined by testing in compliance with ASTM E84. Use only exhibition boards which are certified to meet the following standards:
 - 1. Flame Spread: Not more than 25.
 - 2. Smoke Developed: Not more than 40.
- C. Uniformity of color, corrosion, temperature, alkali, water, range of gloss test, uniform texture, light reflectance and cleanability are requirements for all groups and have specific ranges for each.
- D. Product Certifications: Provide GREENGUARD Indoor Air Quality Certified and GREENGUARD Children and Schools Indoor Air Quality Certificates for markerboards.
- E. Reflectivity of LCSII ceramicsteel Markerboard writing surfaces shall not exceed the following:
 - 1. Gloss Range / 60° Gloss meter GU (Gloss Units)
 - a. LCSII ceramicsteel for Markerboard 68 -76% (low gloss surface).
 - b. LCSII ceramicsteel for writing surfaces - Surface Distortion reduction and the optimum improvement to performance characteristics.
 - 2. Contrast/waviness for Markerboards (light and dark effects) shall be no greater than 15 [Scale 0 - 30] when tested with BYK - Gardner Wave Scan 5+ Measuring device showing visual acuity (contrast sensitivity) to the human eye at distances greater than 3 meters (10'- 0").
 - 3. Resolution (visual acuity) shall be based on 3 lines per degree and be visibly maintained beyond the current standard of 3 meters. [Byk-Gardner Wave Scan 5+ Measuring device].
 - 4. Surface distortion ("orange peel"/surface peaks and valleys) as tested by the BYK-Gardner Wave Scan 5+ Measuring device [Scale 0 - 60]. Values are established by the difference in the highpoint/low point of the Markerboard test surfaces. P 3 ceramicsteel shall establish the lowest range of distortion from 11.7 - 16.02.

1.5 SUBMITTALS

- A. Samples and colors for each:

1. Face sheet materials
 2. Cork materials
 3. Vinyl materials
 4. Aluminum trim types and profiles.
- B. Shop Drawings: Submit shop drawings for each type of drymarker and exhibition board. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout and installation details.
1. Drawings shall indicate location and actual material lengths of each unit. Room elevations shall indicate joint locations and include dimension from floor and adjacent side walls, cross-sections for trim, backing, face and core materials, fastener spacing and types of units provided.
- C. Product Data: Submit manufacturer's technical data and installation instructions for each material and component part, including data substantiating that materials comply with requirements.
- D. Certification: Submit the manufacturer's certification that materials furnished for the project comply with the specified requirements.
- E. Manufacturer's Product Warranty: Submit manufacturer's product and accessories warranty and certificate of authenticity from manufacturer.
- F. Product use, regular cleaning, stain removal and precautions information in the operation and maintenance instructions.

1.6 SPECIAL PRODUCT WARRANTY

- A. Submit a "**Life of Building**" warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer's instructions and recommendations, porcelain enamel steel markerboard writing surfaces are guaranteed for the Life of the Building. Guarantee covers replacement of defective boards, but does not include cost of removal or reinstallation.
- B. Submit a standard warranty, stating that when installed in accordance with manufacturer's instructions and recommendations, exhibition boards are guaranteed for **one (1) year** against defects in materials and workmanship. Guarantee does not cover normal wear and tear, improper handling, any misuse, or any defects caused by vandalism or subsequent abuse. Guarantee covers replacement of defective material, but does not include cost of removal or reinstallation.
- C. Writing Surface Warranty Period: **Lifetime of the building** commencing on the Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: "Series 1", as manufactured by Claridge Products and Equipment, Inc.; or approved equal.

1. Finishes and Colors: Shall be selected by the Architect from manufacturer's available full range of finishes and colors including painted aluminum colors.
- B. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 1. Manufacturers of Porcelain Enamel Dry Markerboards and Exhibition Boards:
 - a. Aarco Products Inc.
 - b. Educational Equipment.
 - c. Platinum Visual Systems
 - d. Or approved equal

2.2 MARKERBOARD MATERIALS

- A. Porcelain Enamel: Provide balanced, high pressure laminated porcelain enamel markerboards of 3-ply construction consisting of facing sheet, core material and backing.
 1. Face Sheet: LCS-II Porcelain Enamel grade cold rolled steel for markerboard, as indicated on drawings..
 - a. Coat the exposed face with a 3-coat process consisting of primer, ground coat and color cover coat, and the concealed face with a 2-coat process consisting of primer and ground coat.
 - 1) Bottom Ground Coat - 1.5 to 2.2 mils
 - 2) Top Ground Coat - 2.0 to 2.8 mils
 - 3) Top Cover (Color) Coat - 3.0 to 4.0 mils
 - b. Fuse cover and ground coats to the steel at the manufacturer's firing temperatures, but not less than 1,200 deg.F (649°C).
 - c. LCS-II Porcelain Enamel for markerboard with improved writing and erasing surface (3 colors low gloss and 3 colors high gloss)
 - d. Facing sheet construction:
 - 1) 1.7-2.5 mils enameled ground coat on face minimum thickness.
 - 2) 3.0 - 4.0 mils enameled cover (color) coat for markerboard.
 - 3) 1.7-2.5 mils enameled minimum ground coat on back of facing.
 - 4) Firing temperatures shall be a minimum of 1200°F for LCSII markerboard.
 2. Writing Surface Core: 7/16" Medium Density Fiberboard (MDF) composed of approximately 90% post-industrial waste.
 - a. Units over 12'-0" in length and longer will require H-bar at center.
 3. Moisture backer shall be factory laminated to core material. A 0.005" thick aluminum backer shall be provided standard on all markerboards.
 4. Perimeter trim shall be as indicated on the architectural drawings.
 5. Markerboard tray(s): Provide item #264M satin anodized finish magnetic markerboard tray(s). Size: 2-3/4" deep x 12" long with 3/4" radius corners.
 6. Maprail: shall be provided on all markerboards and will be either 1" or 2", as indicated on the architectural drawings/details.
 - a. Cork insert to be Claridge Cork, color as selected by Architect.

7. Accessories (1" or 2"):
 - a. Maphooks (minimum two per 4' maprail).
 - b. Flag holder (one per room).
 - 1) Provide separate wall mount flagholder, as required. Coordinate locations with locations of projection screens.
 - c. Map roller brackets (one pair per markerboard).
 - d. Maprail end stops (one pair per display rail).
8. Lamination:
 - a. Factory machine type only.
 - b. Specially formulated adhesives.

2.3 EXHIBITION BOARD MATERIALS

- A. Fabricork: #1380 Vinyl fabric on natural cork underlay with Duracore backing.
- B. Thickness: Total laminated thickness of core and covering is 1/2". All thicknesses are nominal.
- C. Vinyl Fabric: 15 oz/ln yd.
- D. Lamination: Factory machine type with specially formulated adhesive.
- E. Metal Trim and Accessories: Factory fabricated frames and trim of not less than 0.062" thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure. Plastic accessories will not be accepted.

2.4 FABRICATION

- A. Assembly: Provide factory assembled dry markerboard and exhibition board units, except where field assembled units are required.
- B. Make joints only where the total length exceeds the maximum manufactured length. Fabricate with the minimum number of joints, balanced around the center of the board, as acceptable to the Architect.
 1. Provide the manufacturer's standard vertical joint system between abutting sections of dry markerboard.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field Measurements: Take field measurements prior to the preparation of shop drawings and fabrication where possible, to ensure proper fitting of the work. Allow for trimming and fitting wherever taking of field measurements before fabrication might delay work.
- B. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

3.2 INSTALLATION

- A. Deliver factory-built dry markerboard and exhibition board units completely assembled in one piece without joints, wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.
- B. Install units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb and level. Provide all grounds, clips, backing materials, adhesives, brackets, anchors, trim and accessories necessary for a complete installation.
 - 1. Anchor all components securely using tamperproof fasteners, where accessible.
 - 2. Install all dry markerboards and exhibition boards with completely concealed continuous hangers.
 - 3. Where wall mount flagholders is required install units where directed by the Architect/ Owner.
- C. Provide factory-trained installers.
- D. Apply manufacturers' adhesive behind each board using roughly ¼ cup @ 16" on center.
- E. Mounting heights from the floor for each room shall be as follows:

Consult with the Architect / Owner before start of installation:

- 1. Kindergarten 24"
 - 2. First & Second grades 26"
 - 3. Third & Fourth grades 28"
 - 4. Fifth and Sixth grades 30"
 - 5. Seventh - ninth grades 33"
 - 6. Tenth and up grades 36"
- F. Provide covering for H-moldings to match vinyl-covered boards.
 - G. Clean boards using manufacturers' recommended procedures and install cleaning labels for each room.
 - H. Locate accessories on each board as specified.
 - I. Provide mitered and wrapped hairline joints for all trims.
 - J. Provide fasteners at perimeter trims 16" - 24" and 12" - 16" on trays.

3.3 ADJUST AND CLEAN

- A. Verify that accessories required for each unit have been properly installed and that operating units function properly.

- B. Clean units in accordance with the manufacturer's instructions. Break-in markerboards only as recommended by the manufacturer.
- C. Repair or replace all damaged units and surfaces to the approval of the Architect at no additional cost to Owner.

END OF SECTION 10100

SECTION 10440 - SPECIALTY SIGNS

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 DESCRIPTION OF WORK

- A. Extent of specialty signs is shown on the drawings.
- B. Forms of specialty signs required include the following:
 - 1. Panel signs (Room Identification Signs).
 - 2. Installation of all specialty signs.

1.3 QUALITY ASSURANCE

- A. Uniformity of Manufacturer: For each sign form and graphic image process indicated furnish products of a single manufacturer.
- B. All signs shall conform to the International Building Code and ICC/ANSI A117.1. - 2017 requirements for accessible building elements.
 - 1. All signs to permanent rooms and spaces shall include Braille in accordance with N.J.A.C. 5:23-7.11 (j).

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each type of sign required.
- B. Samples: Submit samples of each sign form and material showing finishes, colors, surface textures and qualities of manufacturer and design of each sign component including graphics.
 - 1. Submit full-size sample units, if requested by the Architect. Acceptable units may be installed as part of the work.
- C. Shop Drawings: Submit shop drawings for fabrication and erection of specialty signs. Include plans, elevations, and large scale details of sign wording and lettering layout. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Americraft Inc.
2. Architectural Graphics Inc.
3. ASI Sign Systems, Inc.
4. Bayuk Graphic Systems, Inc.
5. Brandon Signage Co.
6. Designer Sign Company.
7. Gemini
8. Howard Industries
9. Metro Signs.
9. Mohawk Sign Systems.
10. Or approved equal.

2.2 MATERIALS

- A. GENERAL: Provide manufacturer's standard plastic signage which comply with the requirements established in the International Building Code and ICC/ANSI 117.1 - 2017 Barrier Free Standards. All signs to permanent rooms and spaces shall include Braille in accordance with N.J.A.C. 5:23-7.11 (j).
1. Acrylic sheet material to be cut to the desired sizes with radius or square corners as indicated, or as per approved shop drawings.
 2. "Helvetica Regular" letter style, Domed Grade II Braille and other pictograms as described herein.
 3. Colors: As selected by the Architect from manufacturer's standards after award of contract, or as specified herein.

2.3 FABRICATION

- A. Unframed Panel Signs: Fabricate unframed panel signs with edges mechanically and smoothly finished to conform with the following requirements:
1. Edge Condition: Square cut.
 2. Corner Condition: Provide radius corners for each sign type.

2.4 SIGNAGE

- A. GENERAL: ALL signage MUST comply with the requirements established in the International Building Code and ICC/ANSI 117.1 - 2017. All signs to permanent rooms and spaces shall include Braille in accordance with N.J.A.C. 5:23-7.11 (j).
- B. INTERIOR SIGNAGE:
1. Room Names and Numbers Signage:
 - a. Provide Room Name and Numbers plastic signs for all rooms with name and room number, as shown on drawings and schedules.
 - 1) Types "9" Signs - Classrooms and Offices:
 - a) Provide 1/4" thick non-combustible, self extinguishing solid composite plastic sign signs with integral tactile letters, numbers and symbols raised a minimum of 1/32" from sign face. Provide window insert with non-glare clear plastic cover

- b) Basis of Design: Provide "Series 200A Sand Carved process with window insert Series 400 Vinyl Copy" as manufactured by Mohawk Sign Systems Inc.; or equal by Brandon Signage Co.; or approved equal.
 - 2) Type "8" Signs - Multi-Purpose Room, Stage, Cafeteria, Auditorium, Faculty Dining, Main Offices, Media Center, Kitchen, etc. :
 - a) Provide sand-carved process, 1/8" thick non-combustible, self-extinguishing solid composite plastic with integral tactile letters, numbers and symbols raised a minimum of 1/32" from sign face.
 - 3) Informational Signage:
 - a) Provide informational plastic signs at selected doors, as shown on drawings and schedules.
 - i) Signs - "THIS IS NOT AN EXIT", "EXIT", etc.:
 - (1) Provide sand-carved process, 1/8" thick non-combustible, self-extinguishing solid composite plastic with integral tactile letters, numbers and symbols raised a minimum of 1/32" from sign face.
 - 4) Sizes: As indicated or as directed by the Architect / Owner.
 - 5) All room signs shall have radius corners.
2. Room Numbers Signage:
 - a. Provide Room Numbers plastic signs for all rooms with room number, as shown on drawings and schedules.
 - 1) Type "10" Signs - Boiler Room, Elevator Machine Room, Storage, Custodial, Electrical, Mechanical, etc.:
 - a) Provide sand-carved process, 1/8" thick non-combustible, self-extinguishing solid composite plastic with integral tactile letters, numbers and symbols raised a minimum of 1/32" from sign face.
3. Signage Locations:
 - a. Along the door on the latch side and shall be mounted as follows:
 - 1) 48" minimum to the lowest tactile character on the sign measured from the finish floor.
 - 2) 60" maximum to baseline of highest tactile character on the sign measured from the finish floor.
 - b. For locations having double doors, mounting shall be to the right of the right hand door.
 - c. Where there is no wall space on the latch side of the door, including double leaf doors, signs shall be placed on the nearest adjacent wall.
4. Graphic Content and Style: Provide sign copy to comply with the requirements indicated for sizes, styles, spacing, content, positions, materials, finishes and colors of letters, numbers, symbols and other graphic devices.
 - a. Raised Copy Thickness: Not less than 1/32" from the sign face.
 - b. Raised characters shall be in different color and meets the Barrier Free requirements for a 70% contrast ratio of colors. Colors shall be selected from manufacturer's available full range of colors.
 - c. Raised characters and symbols for tactile signs shall be 5/8" high minimum and 2" high maximum. Sign size shall suit the required letters and numbers.

5. Braille Copy: Braille Copy shall be Grade II and shall conform to Specification 800, National Library Service, Library of Congress. Braille shall be raised integral .0625 diameter.
 - a. Braille shall be separated 1/2" minimum from the corresponding raised characters or symbols.
6. Mounting: As directed by the Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Locate sign units and accessories where shown or scheduled, using mounting methods of the type described and in compliance with the applicable Codes and regulation.
- B. Install sign units level, plumb and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- C. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
 1. Silicone Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous or vinyl-covered surfaces.
 - a. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.
 - b. Fasteners and Anchors: Manufacturer recommended concealed types for indicated signage and substrate materials.

3.2 CLEANING AND PROTECTION

- A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 10440

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

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 DESCRIPTION OF WORK

- A. Extent of fire extinguishers, cabinets and accessories is indicated on the drawings.
- B. Definition: "Fire Extinguishers" as used in this section refers to units which can be hand-carried as opposed to those which are equipped with wheels or to fixed fire extinguishing systems.
- C. Type of products required include:
 - 1. Fire extinguishers.
 - 2. Mounting brackets.
 - 3. Signs.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain products in this section from one manufacturer.
- B. Coordination: Verify that fire extinguisher cabinets are sized to accommodate fire extinguishers of type and capacity indicated.
- C. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

1.4 SUBMITTALS

- A. Product Data: Submit product data for each type of product included in this section. For fire extinguisher cabinets include roughing-in dimensions and details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, and panel style and materials.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
 - b. Faulty operation of valves or release levers.

2. Warranty Period: **Six (6) years** from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 1. J.L. Industries.
 2. Larsen's Mfg. Co.
 3. Potter Roemer
 4. Or approved equal.

2.2 FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers for each extinguisher bracket, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.
- B. Fill and service extinguishers to comply with requirements of governing authorities and manufacturer's requirements.
- C. Multi-Purpose Dry Chemical Type: UL-rated 2-A:10:B:C, 5 lbs. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.

2.3 MOUNTING BRACKETS

- A. Provide manufacturer's standard brackets designed to prevent accidental dislodgement of extinguisher, of sizes required for type and capacity of extinguisher indicated, in manufacturer's standard plated finish.
- B. Provide brackets for extinguishers not located in cabinets.

2.4 SIGNAGE

- A. Identification: Signage complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 1. Basis of Design: "PTD-182", V-Shaped Sign - 'FIRE EXTINGUISHER' with picture of extinguisher on red background; or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
- B. Securely fasten mounting brackets to structure, square and plumb, to comply with manufacturer's instructions.

- C. Where exact location of surface-mounted bracket-mounted fire extinguishers is not indicated, locate as directed by Architect.

3.2 IDENTIFICATION

- A. Identify bracket-mounted extinguishers with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style and location as selected by Architect.

END OF SECTION 10522

SECTION 10670 - METAL SHELVING

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 DESCRIPTION OF WORK

- A. Extent of work included is shown on the drawings.
 - 1. Secure Storage Room shelving.

1.3 QUALITY ASSURANCE

- A. Uniformity: Provide each type of metal shelving as produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions.
- B. Samples: Submit color samples for Architect's selection.
- C. Shop Drawings: Submit shop drawings verifying dimensions affecting installations. Show in detail, method of installation and accessories.

1.5 JOB CONDITIONS

- A. Protect from damage during delivery, handling, storage and installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Clip shelving as manufactured by Republic Storage Products, LLC; or approved equal.
- B. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. Provide "Clipper Conventional Flange Shelving" as manufactured by Penco Products Inc.; or approved equal.
 - a. Capacity: Provide metal shelving which shall meet or exceed the Basis of Design indicated load capacity Class.

2.2 STORAGE ROOM SHELVING

- A. Shelving System:

1. Single angle end posts, double angle intermediate posts, 7'-3" high.
2. Number and sizes as shown, 36 inches wide, or as required, 18 gauge with reinforcing bar, front and rear (Class 2B). For shelves 18 inches deep and deeper, provide Class 3 shelves.
3. Include sway braces at rear and at end uprights. Include also a label holder for each shelf.
4. Baked enamel finish, colors as selected by Architect from manufacturer's available full range of standard colors.
5. Provide metal bracket, lead anchor and screws for fastening shelving units to wall. Provide anchors for each shelving unit.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install metal shelving at locations shown in accordance with manufacturer's instructions for plumb, level, rigid, and flush installation.
- B. Anchor shelving to walls and floors.

3.2 ADJUST AND CLEAN

- A. Touch up marred finishes, but replace units which cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by shelving manufacturer.

END OF SECTION 10670

SECTION 10900 - MISCELLANEOUS EQUIPMENT AND FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Part 1 through Part 6 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK

- A. Extent of each type of equipment is shown on drawings.
 - 1. Spray Booth Curtain
 - 2. Spray Booth
- B. Include installation, except that electrical connections will be by Electrical Subcontractor.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, installation instructions, and general recommendations, including data which substantiates that materials comply with requirements.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.
- C. Provide roughing-in drawings to Electrical Subcontractor, as required.

PART 2 - PRODUCTS

2.1 SPRAY BOOTH CURTAIN

- A. Basis of Design: Products as manufactured by Construction Specialties, Inc.; or approved equal.
 - 1. Tracks: Suspended extruded aluminum box-channel, ceiling mounted track not less than 3/4" by 1-3/8" , aluminum alloy 6063-T4, having smooth internal double raceway designed for uninterrupted operation of curtain carriers on both straight and curved installations.
 - a. Finish: Natural anodized.
 - 1) Curtain Carriers: Two wheel nylon, polyethylene or delrin trolleys having center pendant fitted with bright plated - 0.148 diameter wire open hook providing an overall drop of 2" from bottom or rod.
 - 1. Curtains: Provide curtain fabrics as manufactured by Construction Specialties; or approved equal.
 - a. Subject to compliance with requirements, manufacturers offering products and accessories which may be incorporated in the work include the following:
 - 1) Cube Care

- 2) Cubicle Curtain Factory
 - 3) COVOC Corp.
 - 4) Or approved equal.
 - b. Provide permanently flame resistant type fabric for the life of the fabric.
 - 1) Products had been tested to meet or exceeds NFPA, Bulletin 701 and the International Building Code, for smoke developing and flame spread requirements.
 - 2) Provide polyester reinforced, anti-bacterial vinyl fabric , stain resistant, self sanitizing, and easy to maintain. Fabric is strong, fluid proof, stain resistant lightweight, with resistance to wear, tear and abrasion.
 - c. Colors/patterns: As selected by the architect from manufacturer's full range of all available colors, after award of contract.
 - d. Top Hem: Triple thickness of cloth, not less than 1" and not more than 1-1/2" wide, reinforced with integral web and double stitched, fitted with machine-set rustproof grommets spaced 6" o.c.
 - e. Bottom and Side Hems: Triple thickness of cloth, not less than 1" wide, single stitched.
 - f. Seams: Not less than 1/2" wide double turned and double stitched.
 - g. Fullness: Not less than 10 percent.
 - h. Curtain Tieback: At each termination.
 - i. Fiber Content: 100% FR Polyester.
2. Provide separate curtain for each compartment, extending from track to within 12" - 15" of floor.
 3. Install track in one continuous "L" shaped length for each cubicle wherever possible, with perfectly formed 12" radius bends at changes in direction.
 4. Where splicing is necessary, use special formed splice sleeve at least 8" long and of same material and finish as track. Locate splices at least 12" from radius bends.
 5. Secure track to ceiling at intervals of not more than 36". Install end stops at ends of each track, one end stop on each track being removable for replacement of carriers.

2.2 SPRAY BOOTH

- A. Basis of Design: Model No. 79950 includes base cabinet as manufactured by Sheldon; or approved equal.
 1. Unit shall be metal with baked on enamel finish superstructure.
 2. Unit shall have 33" high front opening, equipped with fan and lighting switch, vapor-proof light, 6" exhaust fan with 1/8 H.P. motor; 110 V AC electric receptacle in the cabinet front apron.
 3. Coordinate electrical and mechanical requirements with electrical and mechanical trades.
- B. Subject to compliance with requirements of the Contract Documents, manufacturers offering products which may be incorporated in work include the following:

1. LSI Corp. of America;
2. Diversified Woodcrafts;
3. Or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Demonstrate proper operation of the equipment to Architect's satisfaction. Adjust as required for smooth, efficient operation.
- B. Provide instructions for Owner's personnel, with manufacturer's use and maintenance manuals.
- C. Protect equipment from damage until acceptance of the entire project by the Owner.
- D. Install equipment and materials in accordance with manufacturer's recommendations and instructions for installation.

END OF SECTION 10900

SECTION 11000 - GENERAL REQUIREMENTS - CASEWORK AND EQUIPMENT WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Part 1 through Part 6 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK

- A. Casework and Equipment Work includes all items listed on schedules. All general requirements of this section apply to all equipment Contracts.

1.3 QUALITY ASSURANCE

- A. Products of individual manufacturers are scheduled to establish type and standard of quality. Products of other manufacturers proposed to be used shall meet the published specifications of the specified product as to materials, finishes, design and fabrication, to the satisfaction of the Architect.
- B. Compatibility: Provide each type of equipment by a single manufacturer, including accessories. It is of the utmost importance that a stability of design and interchangeability of parts and pieces be provided, and it shall be specifically understood that a miscellaneous assortment of equipment assembled by dealers or agents will not be considered as meeting requirements of the specification.
- C. Casework and/or Equipment Work specified herein and other Division 11 specification sections have been selected because of their quality of construction, configuration, design, function, available finishes, components, accessories, dimensions, shape and style.
 - 1. Comparable products of other manufacturers will be considered only if it can be clearly shown that their products are equal to or will exceed the construction quality requirements and other design attributes listed by manufacturers for indicated model numbers.
 - 2. The General Contractor will not award subcontract for Casework or Equipment supplier unless the Architect has approved that supplier's samples, certificates, individual product drawings, and proof of ability to perform.

1.4 SUBMITTALS

- A. Submit manufacturer's technical data, catalog cuts and installation instructions for each type of furniture and equipment.
- B. Samples: Submit, for verification purposes, samples of each exposed material from which equipment units and accessories are composed, in each color, finish, pattern and texture indicated. If these qualities are not indicated, submit, for initial selection, manufacturer's color charts or samples of actual materials showing full range of standard colors, finishes, patterns, and textures available. Include samples of the following:

1. Baked enamel finishes for metal components
 2. Wood and plywood materials and finishes
 3. Molded plastic and fiberglass
 4. Exposed fasteners
- C. Submit full-size samples of finished units when complete with hardware, doors, adjustable shelves, etc., when requested by Architect. Acceptable sample units will be used for comparison inspection at project. Unless otherwise directed, acceptable sample units may be incorporated in the work. Notify Architect of their exact locations. If not incorporated in the work, retain acceptable sample units in the building until completion and acceptance of the work. Remove sample units from the premises when directed by Architect.
- D. Shop Drawings
1. Submit shop drawings showing plans, elevations, ends cross-sections. Show details and location of anchorages and fitting to floors, walls and base. Include layout of units with relation to surrounding walls, doors, windows, and other building components.
 2. Coordinate shop drawings with other work involved.

1.5 PRODUCT HANDLING

- A. Deliver casework only after wet operations in building are complete.
- B. Store completed equipment in ventilated place, protected from the weather, with relative humidity therein of 50% or less at 70°F.
- C. Protect sanded and finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective coating.

1.6 JOB CONDITIONS

- A. Advise Architect of requirements for maintaining heating, cooling and ventilation in installation areas as required to reach relative humidity necessary to maintain optimum moisture content.
- B. Examination of Substrate and Conditions
 1. Field measurements shall be taken to verify that the equipment will fit into the designated space. Entry ways, corridors and door openings shall be verified to ensure that the equipment be manufactured in a matter to permit it to be moved through properly into place.
 2. Examine the substrate and the conditions under which the work under this section is to be performed, including condition of substrate to which equipment is to be attached, and notify the Architect, in writing, of unsatisfactory conditions. Do not proceed with work under this section until satisfactory conditions have been corrected in an acceptable manner.

1.7 QUALIFICATION OF SUPPLIERS OF CASEWORK AND EQUIPMENT

- A. That it owns and operates a factory or factories adequate for and devoted to the manufacture of casework, equipment or material which is proposed to furnish and maintains strict inspection and quality control over the various manufacturing operations performed to produce a satisfactory end product of the standard and quality set forth in the detailed specification.
 - 1. That is at the time of submitting products and equipment and had been engaged in the manufacturing of casework or equipment for a recommended 10 consecutive years and has maintained during this time a published catalog of such specialized equipment, including a line similar to the specified.
 - 2. That the manufacturer or his franchised representative shall have a major installation of equipment delivered and installed over a recommended 10 years conforming to the design and quality specified herein.

1.8 VARIATION FROM MATERIALS, PRODUCTS AND EQUIPMENT SPECIFIED

- A. The designs, materials, finishes, functions and upholsteries have been selected by the Owner on the advise of the Architect with intention of creating an integrated building design. For this reason, no variations from the plans, specifications and design guide will be permitted except as noted below.
 - 1. Whenever and wherever in any of the contract documents an article, material or equipment is defined by describing a proprietary product or by using the statement, "as manufactured by", it is the intent that this shall describe by reference the materials desired; craftsmanship and method of manufacture, as well as the size and dimensions rather than detailing all of these requirements herein. It is not the intention to limit the bidding on such items, but merely to indicate that the item must conform to these standards.
 - 2. **Any Laboratory Casework manufacturer requesting equivalence must submit test report from a Scientific Equipment and Furniture Association (SEFA) approved independent testing facility showing compliance with SEFA-8 standards. Failure to provide the required information maybe cause for rejection.**

PART 2 - PRODUCTS

2.1 See Schedule on Drawings.

2.2 GENERAL REQUIREMENTS (As applicable for each Contract)

- A. BASIS OF DESIGN: CATALOG NUMBERS REFER TO CAMPBELL-RHEA CASEWORK CATALOG; OR APPROVED EQUAL, UNLESS OTHERWISE SHOWN, SEE PARAGRAPH 1.2 ABOVE.
- B. ALL CASEWORK DOORS AND DRAWERS TO HAVE LOCKS KEYED ALIKE PER ROOM AND MASTER KEYED.
 - 1. The Contractor shall package keys for each room separately and identify the room number on the package and deliver to the Owner's Representative.

- C. COUNTERTOPS SHALL BE 3/4" PLYWOOD WITH SOLID SURFACE COVERING ON ALL EXPOSED SURFACES (UNLESS NOTED OTHERWISE).
- D. BACKSPASHES SHALL BE SOLID SURFACE SECURED TO THE WALL SURFACE (UNLESS NOTED OTHERWISE).
- E. ALL FURNITURE, CASEWORK AND EQUIPMENT SHOWN DOTTED AND/OR IS INDICATED AS (N.I.C.) IS NOT IN CONTRACT.
- F. UNLESS OTHERWISE SHOWN, THE CASEWORK AND EQUIPMENT WORK SUBCONTRACTOR SHALL SUPPLY AND DELIVER ALL SINKS, TAILPIECES, FAUCETS AND STRAINERS IN CASEWORK TO THE PLUMBING AND DRAINAGE WORK SUBCONTRACTOR.
 - 1. PLUMBING SUBCONTRACTOR SHALL SUPPLY AND INSTALL ALL TRAPS, VALVES ETC AND SHALL MAKE FINAL CONNECTIONS TO ALL WASTE/VENTS AND WATER LINES, ETC., AS REQUIRED, TO MAKE SYSTEMS FULLY FUNCTIONAL.
 - 2. UNLESS OTHERWISE SHOWN, CASEWORK AND EQUIPMENT SUBCONTRACTOR SHALL MAKE SINK CUT-OUTS.
 - 3. SINK CABINETS TO BE INSTALLED BEFORE THE INSTALLATION OF ADJACENT CABINETS.
- G. UNLESS OTHERWISE SHOWN, CASEWORK AND EQUIPMENT WORK SUBCONTRACTOR SHALL SUPPLY AND DELIVER ALL DUPLEX OUTLETS, SWITCHES, AND COVER PLATES ETC., AS REQUIRED, FOR INSTALLATION IN CASEWORK, TABLES, ETC., TO THE ELECTRICAL SUBCONTRACTOR, READY FOR INSTALLATION AND FINAL CONNECTION BY ELECTRICAL SUBCONTRACTOR.
 - 1. ALL DUPLEX OUTLETS SHALL BE G.F.I.C. UNLESS NOTED OTHERWISE.
- H. ALL CONTRACTORS TO FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO CONSTRUCTION AND NOTIFY ARCHITECT IN WRITTEN FORM OF ANY DISCREPANCIES.
- I. PROVIDE ALL FILLERS, AS REQUIRED. FINISH TO MATCH CASEWORK.
- J. UNLESS OTHERWISE SHOWN, RUBBER BASE ON ALL CASEWORK BY G.C.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Condition casework and furniture to average prevailing humidity conditions in installation areas prior to installing.

3.2 INSTALLATION

- A. Deliver, uncrate, set in place and install plumb, level, true and straight with no distortions.

Shim as required, using concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Before making cutouts, drill pilot holes in corners.

- B. Trim and Moldings: Install in single, unjointed lengths for openings and for runs less than maximum length of lumber available. For longer runs, use only one piece less than maximum length available in any straight run. Stagger joints in adjacent members.
- C. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- D. Adjust shelving, tables and chair heights (if applicable), as required and as directed by the Architect/Owner.
- E. Inspect for dents, scratches, stains, holes, etc. Replace any items showing damage, loose joints or other defects.

3.3 CLEANING AND PROTECTION

- A. Clean and polish all items, remove packing cases and debris from the site.
- B. Protection: Perform all procedures and precautions for protection of materials and installed casework from damage by the work of other trades until acceptance of the work by the Owner.
- C. Cover casework with 4-mil polyethylene film for protection against soiling and deterioration during remainder of construction period.

END OF SECTION 11000

SECTION 11011 - CASEWORK AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Section Includes: Wood Casework and related equipment.
1. Pre-manufactured wood casework and equipment, covered by this specification and accompanying drawings, are manufactured or supplied by one manufacturer to avoid divided responsibility.
- B. Work included in this section:
1. Furnish all items of equipment as listed in the specifications, equipment schedule and/or as shown on the drawings, including delivery to the building, unpacking, setting in place, leveling, and scribing to walls and floors as required.
 2. **Furnishing:** Equipment Subcontractor shall make cutouts, holes and openings in countertops so as to be ready for installation of fixtures by the Plumbing Work Subcontractor.
 - a. The Casework and Equipment Subcontractor(s) shall turn over to the Plumbing Subcontractor in a package, all sinks, fixtures, faucets, tailpieces, strainers, etc., and nipples and locknuts, etc., for installation and final connection by the Plumbing Subcontractor.
 3. **Furnishing:** Equipment Subcontractor shall make cutouts, holes and openings in countertops so as to be ready for installation of fixtures by the Electrical Work Subcontractor.
 - a. The Casework and Equipment Subcontractor(s) shall turn over to the Electrical Subcontractor in a package, all electrical devices, for installation and final connection by the Electrical Subcontractor.
 4. The Casework and Equipment Subcontractor shall provide an itemized lists and a designated site location for the transfer of the above referenced materials to the Plumbing and Electrical Subcontractors. The list shall have a description of the items and quantity along with a sign-off line for the Plumbing and Electrical Subcontractor(s).
 - a. **A copy of the signed list is to be submitted to the Architect/Owner prior to billing for this equipment.**
 5. All debris, dirt and rubbish accumulated as a result of this installation shall be removed and the premises left clean and orderly.
 6. All contractors shall familiarize themselves with the job conditions and building measurements in order to coordinate the planning, design, connections, delivery and erection of the fixed casework and related equipment furnished under these specifications with other related and associated work during the term of this contract.

- C. Work included under the work of other contracts:
1. The **connection** of sinks, tailpieces, traps, service lines, drainlines, and piping within the equipment and through, under or along the backs of working surfaces as required by the specifications and/or as shown on the drawing shall be by the Plumbing and Drainage Work Subcontractor in accordance with Part-4 Specifications Sections.
 2. The **connection** of electrical receptacles, shall be by the Electrical Work Subcontractor in accordance with Part-6 Specifications Sections.
 3. The furnishing of any framing or reinforcements for walls, floors, or ceilings to support any equipment, General Construction Work Contractor in accordance with Part-2 Specifications Sections.

1.2 QUALITY ASSURANCE

- A. Provide all casework (for integration with tops, sinks and service fixtures, as required) manufactured or furnished by the same company for single responsibility.
- B. Basis of Design: **"Campbell Rhea - Classic Oak Series", as manufactured by Institutional Casework, Inc.;** or approved equal.
- C. Products specified herein have been selected because of their quality of construction, configuration, design, function, available finishes, components, accessories, dimensions, shape and style.
1. Comparable products of the following manufacturers will be considered if it can be clearly shown that their products are equal to or will exceed the construction quality requirements and other design attributes listed above.
 - a. Diversified Casework.
 - b. Leonard Peterson - Vanguard Line, Lipped.
 - c. TMI Systems Design Corp.
 - d. Or approved equal.
 2. The use of one manufacturer's catalog numbers, and the specific requirements set forth in drawings and specifications, are not intended to preclude the use of other manufacturer's products or procedures which may be equivalent, but are given for the purpose of establishing a standard of design and quality for materials, construction and workmanship.
 3. Substitute products will be considered for substitution only when submitted to the Architect as per the requirements of AIA A201 and Section 00800.
 4. Substituted product(s) shall be meet the following minimum requirements:
 - a. All four corners of drawer boxes must be dove-tailed together, and the bottom of all drawer boxes must be let in to the sides, front and back, to be "fully captured." Applied drawer bottoms will not be permitted.
 - b. All drawer front shall be fabricated from solid red oak lumber.
 - c. All cabinet doors shall be framed with solid oak rails on four sides. Tall case doors shall include a lightweight core to reduce stress on hinges. Doors constructed of

plywood or particleboard, edge-banded with oak will not be permitted. Tall case doors shall be mounted with (4) hinges.

- d. All tall case doors shall be complete with three-point latching mechanism. Single-point latching will not be permitted.
5. The General Contractor will not award subcontract to a wood laboratory casework supplier who is not on the approved list, unless the Architect has approved that supplier's samples, certificates, individual product drawings, and proof of ability to perform.

1.3 SUBMITTALS

- A. Submit two copies of manufacturer's data and installation instructions for each type of equipment.
- B. Samples:
 1. Submit samples of available laminated plastic patterns and colors for Architect's selection.
 2. Submit one full size sample of finished base cabinet unit complete with hardware, doors and drawers, without finish top.
 3. Submit one full size sample of finished wall mounted cabinet unit complete with hardware, doors and adjustable shelves.
 4. Acceptable sample units will be used for comparison inspections at project. Unless otherwise directed, acceptable sample units may be incorporated in the work. Notify Architect of their exact locations. If not incorporated in the work, retain acceptable sample units in the building until completion and acceptance of the work.
 5. Remove sample units from the premises when directed by the Architect.
- C. Shop Drawings
 1. Submit shop drawings showing plans, elevations, ends, cross-sections, service run spaces, locations and type of service fixtures with lines thereto. Show details and location of anchorages and fitting to floors, walls and base. Include layout of units with relation to surrounding walls, doors, windows, and other building components.
 2. Coordinate shop drawings with other work involved.
- D. **Test Reports - Certifications:**
 1. Submit the following:
 - a. Test reports certifying that the casework finish complies with chemical and other resistance requirements of the specifications.
 - b. Performance test reports from an independent testing lab on each specified top material.

1.4 PRODUCT HANDLING

- A. Deliver casework only after wet operations in building are complete.
- B. Store completed wood furniture in ventilated place, protected from the weather, with relative humidity therein of 50% or less at 70°F.
- C. Protect sanded and finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective coating.

1.5 JOB CONDITIONS

- A. Advise Architect of requirements for maintaining heating, cooling and ventilation in installation areas as required to reach relative humidity necessary to maintain optimum moisture content.
- B. Examination of Substrate and Conditions
 - 1. Field measurements shall be taken to verify that the equipment will fit into the designated space. Entry ways, corridors and door openings shall be verified to ensure that the equipment be manufactured in a matter to permit it to be moved through properly into place.
 - 2. Examine the substrate and the conditions under which the work under this section is to be performed, and notify the Architect, in writing, of unsatisfactory conditions. Do not proceed with work under this section until satisfactory conditions have been corrected in an acceptable manner.

1.6 WARRANTY

- A. Manufacturer shall warrant the casework to be free from defects in materials and workmanship, under normal use and service, for **three (3) years** from date of delivery.
 - 1. Within the warranty period, manufacturer shall repair, replace, or refund the purchase price of defective casework.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The best cabinet making practices for casework construction shall be followed. All cabinets shall be integral units, each completely enclosed without the use of common partitions unless otherwise specified.

2.2 MATERIALS

- A. Lumber:
 - 1. Oak lumber is red oak, grade FAS or better, air dried and kiln dried to a 6 percent moisture content, then tempered to 7-8 percent prior to fabrication. Red oak lumber exposed to view, is free of stains, splits, shakes, season checks and other similar defects.

2. Other hardwoods are grade FAS or better, air dried to a 6 percent moisture content, then tempered to 7-8 percent prior to fabrication. Other hardwoods are used in semi-exposed, or unexposed, areas and comply with NHLA grading for FAS or better lumber.

B. Plywood:

1. Oak plywood is red oak, grade A-2, plain sliced, book-matched, crossbanded, and has a solid core.
 - a. 3/4 inch is a minimum of 7-ply.
 - b. 1/2 inch is a minimum of 5-ply.
 - c. 1/4 inch is a minimum of 3-ply.
 - d. 3/32 inch is a minimum of 3-ply.
2. Other hardwood plywoods are sound grade, have a solid core and are suitable for semi-exposed or unexposed areas.
 - a. 3/4 inch is a minimum of 7-ply.
 - b. 1/2 inch is a minimum of 5-ply.
 - c. 1/4 inch is a minimum of 3-ply.
 - d. 3/32 inch is a minimum of 3-ply.

C. Hardboard:

1. Hardboard is service tempered and consists of steam-exploded wood fibers, highly compressed into a hard, dense, 1/4 inch thick, homogeneous sheet, using natural resins and other added binders.
2. Physical properties:
 - a. Average modulus of rupture is 5,300 lbs./sq. inch
 - b. Density is 50 to 60 lbs./cu. foot
 - c. Tensile strength of 3,500 lbs./sq. inch.

D. Particleboard:

1. Particleboard is industrial grade.
2. Physical properties:
 - a. Density, 46 to 50 lbs./cu. ft.
 - b. Modulus of rupture, minimum, 2,200 psi
 - c. Modulus of elasticity, minimum, 450,000 psi.

E. Service Fixtures:

1. Water, or other services: Triple chrome plated, have heavy-duty construction and are specifically designed for laboratory use.
 - a. **Water Faucets - Hot and Cold:** Faucets are cast from red brass, and have four-arm type handles with color coded indexes. Faucets have serrated hose nozzles. Faucets have patented REX unit ceramic disc cartridges, and replaceable seats. The stem is brass, with full Acme threads, and has a brass cap nut. Goosenecks are rigid. Fixture outlets are tapped 3/8 inch I.P.S. for aerators, vacuum breakers, hose

connections, and or other accessories. Provide vacuum breakers.

(1) Provide lever handle type faucet control for barrier free applications in accordance with sink notes indicated on drawings.

- b. **Vacuum Breakers:** Watts NLF-9, or comparable, vacuum breakers are brass with polished chrome plating, screw-in type with stainless steel working parts, and durable rubber diaphragm and disc. Vacuum breaker is for hot or cold faucet and has a primary valve with a soft disc that seats against mating part. The secondary check valve utilizes a soft disc to metal seating. Breaker is tapped 3/8 inch N.P.T.
2. Electrical Fixtures: Receptacles are 3-wire grounded, 20 A, 125V AC, with stainless steel cover plates and cadmium-plated steel boxes. Pedestal boxes are brushed, cast aluminum with conduit nipples and lock nuts.
 - a. G.F.I. fixtures: 20 A, 125V AC, with a brown nylon face and a LED indicator light. Conform to UL Standard 943 Class A, have hospital grade high abuse receptacle construction, and certified corrosion resistance with cupro-nickel exposed metal parts. Provide terminal screw wiring connections and a trip time of 0.025 seconds.
 3. Sinks and Sink Outlets:
 - a. **Stainless steel** sinks have a satin finish. They are 18 gauge, type 304, 18-8 stainless steel, with heavily undercoated bottoms and positive pitch drains. Outlets are chrome plated brass. Drain holes are 3-1/2 inch diameter for 4-1/2 inch stainless steel cup strainers. The cup strainer has a neoprene stopper. Provide necessary tail pieces to tie into plumbing roughing, typical.

NOTE: Coordinate with Plumbing Drawings and Specifications.

F. Tops (See Equipment Schedule):

1. Maple
 - a. Natural maple top composed of laminated strips of electronically glued, select hard maple. Top surface is finished with two coats of UV cured, penetrating acrylic sealer; and the bottom surface receives one coat. Standard thickness is 1-3/4" and the curb is 4" high and 3/4" thick.
2. Solid Polymer Fabrications (Solid Surface): Refer to Section 06650.

G. Hardware and Accessories:

1. Pulls: Shall be selected by the Architect from manufacturer's available standard and custom units at no additional cost to the Owner.
2. Handles:
 - a. Latching handle LH-1 is die cast zinc alloy, 4-1/4 inches long, has a dull chrome plated finish. Handle operates with 1/4 turn. Double door cases have latching handles on the right door and dummy handles on the left door. The rods are 5/16 inch in diameter and move in nylon guides attached to the back of the door. The middle of the door is secured by a latch plate which engages the side of the case, or latches behind the left door on cases with double doors.
 - b. Locking handle LK-1 is a latching handle with a lock mechanism incorporated into the handle head. On double door cases, the left door has a dummy handle, and

the right door has the locking handle. Lock is laboratory grade with a 5-disc tumbler mechanism and a dull chrome plated face. Tumblers and keys are brass, while the plug and cylinder are die cast zinc alloy.

3. Locks:
 - a. Lock SL-1 is a laboratory grade, cylinder cam lock, with a 5-disc tumbler mechanism, and a dull chrome plated face. Tumblers and keys are brass, while plug and cylinder are die cast zinc alloy. Lock operates with a 180 degree turn of the key. There are 500 key changes standard. Locks are keyed differently, master keyed and furnished with 2 keys per lock.
 - b. Locks are to be furnished on all doors and drawers.

4. Hinges:
 - a. Hinge CP-1 is heavy duty, institutional type, 5-knuckle hospital tipped, and made from .095 inch thick, chrome plated mild steel. Hinge is wrap around style, and 2-3/4 inches high. The wing for mounting to end panel has 4 holes, two of which are slotted for adjustability; wing for the door has 5 holes, two of which are slotted for adjustability.
 - b. Elbow catch is a steel, spring loaded catch that releases with finger pressure. The catch and steel strike plate are mounted with screws. Strike plate screw holes are slotted for adjustability and pin hole is provided to help anchor its position.

5. Drawer Slides:
 - a. Drawer slides DS-1 are electrostatically epoxy powder coated, cold rolled steel, heavy-duty, side mounted, and have a 150 lb. load capacity. They are equipped with heavy-duty, ball bearing nylon rollers for smooth effortless operation. Slides have automatic positive stop levers to prevent accidental drawer removal, but allow quick removal without tools.
 - b. File drawer slides FD-1 are zinc plated, cold rolled steel, heavy-duty, side mounted, and have a 100 lb. load capacity. They are equipped with heavy-duty, ball bearing nylon rollers. Slides are full extension with a positive stop, and a lift out disconnect.

6. Shelf Clips:
 - a. **Shelf support clips shall be "seismic" twin pin type for mounting on interior of cabinet work. Clips shall be corrosion resistant and shall retain shelves from accidental removal. Shelves in all cabinets are adjustable on 32mm centers.**
 - 1) **Single pin support clips and surface mounted metal support strips and clips subject to corrosion are not acceptable.**

7. Leg Shoes:
 - a. Leg shoes are closed-bottom style, 2½ inches square, and molded of 1/8 inch black polyethylene.

H. Safety Glasses / Goggle Monitor Cabinet:

1. A sturdy, reinforced steel cabinet with baked white enamel finish and vandal resistant locking double doors. Equipped with eight (8) universal shelves that hold five (5) #6788 gogles per shelf for a total of 40 goggles.

2. A built-in germicidal lamp sanitizes the goggles between wearings, and is fully shielded from the front to prevent accidental exposure. An automatic 5 minute timer controls the sanitizing period. A seven and a half foot long, three-wire grounded cord with plug is mounted on the right end of the cabinet.

I. Flammable Storage Cabinet:

1. Equipment: One adjustable shelf; swinging doors open to 180 degrees and have a 3-point latching system with built-in lock.

2.3 FABRICATION

A. Factory assembly of casework in the largest components possible aids in the installation. Mortise and tenon construction with glued and screwed joints is used for maximum strength; and the use of precision jigs and clamps ensures square corners and plumb vertical surfaces.

B. Fabrication of laboratory casework and equipment is completed to dimensions in the final, approved copy of shop drawings.

C. Base Cabinets:

1. All base cabinets are rigidly constructed, integral units with the strongest most advanced joinery methods utilized of bored, doweled, dadoed, glued and screwed construction. Each base cabinet is completely enclosed without the use of common partitions, and has flush construction with overlapping doors and drawers, which provides a dust resistant interior. A base cabinet has a full horizontal top frame with bored, doweled and glued joints, intermediate front rails and a 3/4 inch plywood bottom; rear horizontal parting rails and separators are provided as required. Horizontal top frame, intermediate parting rails and the bottom are bored, doweled and glued. Separators where indicated, are let into routed intermediate rails. Backs are recessed and encapsulated into dadoed end panels and further secured with glue blocks on each side, except where they need to be removable for access to plumbing. Backs are screwed to the top frame and further secured with glue blocks on each side. An enclosed toe space, 2-1/4 inches by 4 inches, is furnished with the toe rail bored, doweled and glued to end panels.

D. Wall and Upper Cases:

1. All wall and upper cases are rigidly constructed, integral units with the strongest most advanced joinery methods utilized of bored, doweled, dadoed, glued and screwed construction. Each case is completely enclosed without the use of common partitions, and has flush construction with overlapping doors, which provides a dust resistant interior. Top panel is bored, doweled and glued into end panels. Bottom panel is bored, doweled and glued into end panels; and glued and screwed to the back. Backs are recessed and encapsulated into dadoed end panels, and further secured with glue blocks on each side. Exterior hanger rails, at the top of the back, are glued to the back and then screwed to the top panel and bored, doweled and glued into end panels. Exterior hanger rails, at the bottom of the back, are glued to the back and then screwed to the bottom panel and bored, doweled and glued into end panels. Adjustable shelves are supported on **“seismic” twin pin type** shelf clips, which fit into holes drilled 32 mm on centers, in the case end panels.

E. Tall Cases:

1. All tall cases are rigidly constructed, integral units with the strongest most advanced joinery methods utilized of bored, doweled, dadoed, glued and screwed construction. Each case is completely enclosed without the use of common partitions, and has flush construction with overlapping doors, which provides a dust resistant interior. Top panel is bored, doweled and glued into end panels. Bottom panel is bored, doweled and glued into end panels and glued and screwed to the back. An exterior back cross rail is provided at the top of each case, glued to the back, and then screwed to the top panel and bored, doweled and glued into the end panels. Additional back cross rails are provided, as required. Backs are recessed, let into dadoed end panels, and further secured with glue blocks at the sides. An enclosed toe space, 2-1/4 inches by 4 inches high, is furnished with toe rail securely bored, doweled and glued to end panels and bottom panel.
2. Rails:
 - a. Interior: 2-1/4 inches by 3/4 inch, solid hardwood
 - b. Exterior: 4-1/8 inches by 3/4 inch, solid oak
3. Top panel, bottom panel, dividers, fixed shelf and adjustable shelves:
 - a. Cases with exposed interiors: All are 1 inch oak plywood
 - b. Cases with unexposed interiors: All are 1 inch hardwood plywood.
4. Backs:
 - a. Cases with exposed interiors and exposed exteriors: Back is 1/4 inch oak plywood.
 - b. Cases with unexposed interiors and unexposed exteriors: Back is 1/4 inch service tempered hardboard.
5. End panels:
 - a. Cases with exposed interiors: End panels are 3/4 inch oak plywood.
 - b. Cases with exposed exteriors: end panels are 3/4 inch oak plywood.
 - c. Cases with unexposed interiors and one exposed end panel and one unexposed end panel: Exposed end panel is 3/4 inch oak plywood; unexposed end panel is 3/4 inch hardwood plywood.
 - d. Cases with unexposed interiors and unexposed exteriors: end panels are 3/4 inch hardwood plywood.
6. Exposed edges of end panels, dividers and shelves are edge banded with 1/4 inch solid oak.
7. Exterior back cross rails: 3 inches by 3/4 inch hardwood plywood.

F. Drawers:

1. Components:
 - a. Drawer front: 13/16 inch oak lumber.
 - b. Drawer sides and back: 1/2 inch hardwood lumber.
 - c. Drawer bottom: 1/4 inch service tempered hardboard.
 - d. Construction: All four corners of the drawer are dovetailed and glued. Edges of the

drawer front are machine radiused to form a lip and overlap the opening 1/4 inch on all sides. Drawer fronts are one piece of lumber, providing consistency in color and grain within each drawer front. The back perimeter of the drawer front is routed so drawer front is recessed into the opening and projects 13/32 of an inch. The top edge of drawer sides and back are radiused. The bottom is let into the box on four sides and securely glued underneath with a continuous bead of glue around the perimeter of the drawer bottom. In cabinets 24 inches or less in width, drawers have one, AL-1 aluminum pull which is surface mounted with 2 screws, 4 inches on centers. In cabinets over 24 inches wide, drawers have two AL-1 aluminum pulls. Drawers are supported on DS-1 slides which are side mounted, heavy duty, electrostatically epoxy powder coated, cold rolled steel, and have a 150 lb. load capacity. Slides are equipped with heavy-duty, ball bearing nylon rollers for smooth effortless operation. DS-1 slides have automatic, positive stop levers to prevent drawer's accidental removal, but allow for quick removal without tools. File drawers are supported on side mounted FD-1 full extension steel slides. File drawers have an interior, screw mounted, metal bottom track and an adjustable metal file follower. Lock SL-1 is furnished when indicated.

G. Doors:

1. Hinged solid doors, 48 inches or less in height:
 - a. Core ply: Solid oak rails on four edges framing a particleboard core.
 - b. Hardwood plywood crossbands: Four; two laminated on each side of core ply.
 - c. Red oak veneer: Face plys; one applied to each side.
 - d. Construction: Hinged solid doors, 48 inches or less in height, are 13/16 inch thick and have solid oak rails on the four edges. Doors overlap the opening 1/4 inch on all sides and have machined radiused edges. Doors have one aluminum pull which is surface mounted with two screws. Doors have two, CP-1 chrome plated, heavy duty, institutional type, 5-knuckle hospital tipped hinges, each attached with 5 tempered steel screws into solid oak framing of door, and 4 Euro screws into the end panel. Doors are secured by zinc plated steel, friction roller catches, with positive action, spring cushioned, polyethylene roller, and a metal strike plate. Catch and steel strike plate are attached with screws. On lockable double door cabinets, the left door is secured with a steel, spring loaded, elbow catch that releases with finger pressure. The catch and the strike plate are attached with screws. Strike plate screw holes are slotted for adjustability and a pin hole is provided to help anchor plate's position. Lock SL-1 is furnished when indicated.
2. Hinged solid doors over 48 inches in height:
 - a. Core ply: Solid oak rails on four edges framing a particleboard core.
 - b. Hardwood plywood crossbands: Four; two laminated on each side of core ply.
 - c. Red oak veneer: Face plys; one applied to each side.
 - d. Construction: Hinged solid doors over 48 inches in height, are one inch thick and have solid oak rails on the four edges. Doors overlap opening 1/4 inch on all sides, and machined radiused edges. Single doors and right door of double doors have a LH-1 latching handle, which is 4-1/4 inches long, streamline design, with a dull chrome plated finish. Handle operates with 1/4 turn. Left door of double doors has a fixed handle, which is the same size and finish as a LH-1 latching handle. A three point latching system provides single doors and right door of double doors positive engagement at the top and bottom of the door with tapered aluminum rods which

engage plastic strike plates and pull the door snug. The rods are 5/16 inch in diameter and move in nylon guides attached to the back of the door. The middle of the door is secured by a latch plate which engages the side of the case, or latches behind the left door on cases with double doors. Right door of double doors lap over the integral machined astragal on left door, securely holding door shut. Doors have three, CP-1 chrome plated, heavy duty, institutional type, 5-knuckle hospital tipped hinges; each attached with 5 tempered steel screws in to solid oak framing of the door, and 4 Euro screws into the end panel. Left door of double doors is additionally secured with two zinc plated steel, friction roller catches, with positive action, spring cushioned, polyethylene roller, and a metal strike plate. Catches and steel strike plates are attached with screws. Catch screw holes are slotted for adjustability, and the strike plate has two nips to help anchor its position. Locking handle LK-1 is furnished when indicated.

H. Casework Finishes:

1. Surfaces to be Finished: Exposed exterior and exposed interior surfaces of cabinets receive the full finishing process. The unexposed interior surfaces of cupboards, drawers, wall cases, upper cases, and tall cases receive a baked on protective coat of moisture and chemical resistant catalyzed sealer, and a top coat of clear, catalyzed conversion varnish. Other unexposed surfaces are processed through standard finishing steps, and receive a baked on protective coat of moisture and chemical resistant catalyzed sealer.
2. Finishing Process: Prior to assembly lumber for doors, drawers and cabinets, and plywood for cabinets, are machine sanded with 120 grit, 180 grit, and finally, 220 grit sand paper. Flat surfaces receive two additional machine sandings: one in an orbital crossbelt sander with 40 micron and 60 micron grit sanding belts; and, one through a rotary polisher with 150 grit sand paper. Door and drawer front edges are machine sanded to a very smooth surface through a profile edge sander utilizing a 100 grit and a 150 grit paper. After assembly, drawers, doors, and casework are thoroughly examined and fine-finished by hand to provide a consistently smooth surface. Prior to the first application in the finishing process, items are placed in the dust-off booth where compressed air is used to remove loose fibers and dust. Selected surfaces are stained with NGR stain to the desired color and allowed to dry. Next a protective coat of moisture and chemical resistant, catalyzed sealer is applied. After flash drying, items are oven baked at 130°F. Following a cool down period, surfaces that receive the final top coat are carefully hand sanded and wiped clean. A top coat of clear, catalyzed, conversion varnish is applied, allowed to dry, and then oven baked at 130°F. The final top coat provides chemical resistance, toughness, durability, and excellent color stability with a smooth finish and high-gloss lustre.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Condition casework and furniture to average prevailing humidity conditions in installation areas prior to installing.

3.2 INSTALLATION

- A. Install plumb, level, true and straight with no distortions. Shim as required, using concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Before making cutouts, drill pilot holes at corners. Install wall cabinets in accordance with details on drawings.
- B. Trim and Moldings: Install in single, unjointed lengths for openings and for runs less than maximum length of lumber available. For longer runs, use only one piece less than maximum length available in any straight run. Stagger joints in adjacent members.
- C. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 CLEANING AND PROTECTION

- A. Repair or remove and replace defective work as directed upon completion of installation.
- B. Protection: Perform all procedures and precautions for protection of materials and installed casework from damage by the work of other trades until acceptance of the work by the Owner. Advise HVAC Contractor of the required temperature/humidity conditions which must be maintained during the remainder of the construction period.
- C. Cover casework with 4-mil polyethylene film for protection against soiling and deterioration during remainder of construction period.
- D. Clean up cut out pieces, sawdust and debris, packing cases, etc. Leave areas in broom clean condition. Remove all debris as a result of work of this Contract.

END OF SECTION 11011

SECTION 12496 - WINDOW ROLLER SHADES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Provide manually and electrically operated, sunscreen and / or blackout roller shades as required per these bid documents. Work includes local, group and master control systems for shade operation with addressable, encoded, Electronic Drive Units (EDU).
- B. Roller shades, manual operation, and accessories.
- C. Shade fabric.

1.2 RELATED SECTIONS

- A. Division 06 - Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.
- B. Division 09 - Gypsum Board Assemblies: Coordination with gypsum board assemblies for blocking, installation of shade pockets, closures, and related accessories.
- C. Division 09 - Acoustical Ceilings: Coordination with acoustical ceiling systems for blocking, installation of shade pockets, closures, and related accessories.
- D. Division 26 - Electrical: Electric service for EDU's, and EDU controls, internal communication, low voltage wiring and data transfer, and connection to the Internet and required.

1.3 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM G21 and E 2180 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- B. Cradle to Cradle Products Innovation Institute (C2C):
 - 1. C2C (DIR) - C2C Certified Products Registry.
- C. National Fire Protection Association (NFPA):
 - 1. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - 2. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- D. Underwriters Laboratories (UL):
 - 1. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.
 - 2. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.
- E. Window Covering Manufacturers Association (WCMA):
 - 1. WCMA A100.1 - Safety of Window Covering Products; 2018.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
2. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.
3. See Section 01700 – for additional administrative requirements and submittal procedures.

1.5 SUBMITTALS

- A. Bid Submittal: Information Required with Submittal of Bid: In order to evaluate proposals for integrated lighting control and window shade systems, the Architect requires the following information be submitted prior to the award of the system.
 1. Bid proposal shall be accompanied with a document that notes all deviations from these specifications on a line-by-line basis.
 2. Bid shall confirm that roller shade EDU's and all related controls shall be integrated into a compatible control system as specified herein.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
 3. Storage and handling requirements and recommendations.
 4. Mounting details and installation methods.
 5. Typical wiring diagrams including integration of EDU controllers with building management system, audiovisual and lighting control systems as applicable.
 6. Operation and Maintenance Data: Component list with part numbers, and operation and maintenance instructions.
- C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, power and control wiring diagrams, and relationship to adjacent work.
 1. Prepare shop drawings on AutoCAD format using base sheets provided electronically by the Architect.
 2. Prepare control, wiring diagrams based on, switching and operational requirements provided by the subcontractor in electronic format.
 3. Include one-line diagrams, wire counts, coverage patterns, and physical dimensions of each item.
 4. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
 5. Provide location plan showing all motor locations, switch locations and control zones as per the performance requirements of the specifications. All switches, sensors and other control accessories must clearly be shown and called out in a bill of materials.
6. Provide location plan showing all manual shade control locations. Cross-reference furniture plans for optimal positioning of chains.
- D. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shade cloth samples and aluminum finish sample as selected. Mark face of material to indicate interior faces.
 1. Shadecloth Sample: Mark face of material to indicate interior faces. Verification Samples: 6 inches (150 mm) square, representing actual materials, color and pattern.

- E. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls
- F. Warranty: Provide manufacturer's warranty documents as specified in this Section.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain roller shades system through one source from a single manufacturer with a recommended minimum of ten years' experience and minimum of five projects of similar scope and size in manufacturing products comparable to those specified in this section. This includes but is not limited to all required extrusions, accessories, controls and fabricated roller shades or else all stated and published warranties may be void.
- B. Installer Qualifications: Engage an installer, which shall assume responsibility for installation of all system components, with the following qualifications.
 - 1. Installer for roller shade system shall be trained and certified by the manufacturer with a recommended minimum of ten years' experience in installing products comparable to those specified in this section.
- C. Fire-Test-Response Characteristics: Passes NFPA 701(-99) small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- D. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing. Where applicable, system components shall be FCC compliant.
- E. PVC-Free Shade cloth: Comply with the following.
 - 1. Shade cloth Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, and ATCC9645 and E2180.
 - 2. Requirements for Hardware, Controls, and Switches:
 - a. Roller Shade Hardware, shade fabric, EDU, and all related controls shall be furnished and installed as a complete two-way communicating system and assembly.
- F. Mock-Up: Provide a mock-up, if Architect requires, of one roller shade assembly for evaluation of mounting, appearance and accessories. Locate mock-up in window designated by Architect. Do not proceed with remaining work until, mock-up is accepted by Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Power and control wiring shall be complete and certified, fully operational with uninterrupted communication on the lines and minimal noise certified by a commissioning agent (by others).

1. 485, ICON, Lonmark and Dry Contract Network: Noise on the line not to exceed shade manufacturer's limits.

1.9 WARRANTY

- A. Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-depreciating, transferrable warranty for interior shading. Provide manufacturer's standard warranties, including the following:
 1. Shade Hardware – **Ten (10) years** unless otherwise indicated:
 - a. ElectroShade with ThermoVeil, EuroTwill, Soho, Equinox, Midnite, Chelsea, or Classic Blackout shade fabric: **Twenty-five (25) years**.
 2. Standard Shadecloth: Manufacturer's standard **Twenty-five (25) year** warranty.
 3. Roller Shade Motors, Motor Control Systems, and Accessories: Manufacturer's standard non-depreciating **Ten (10) year** warranty for AC motors and controls
 4. Roller Shade Installation: **One (1) year** from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas, which are deemed owners responsibility.
 5. Roller Shade EDU's and EDU Control Systems: Manufacturer's standard non-depreciating **five (5) year** warranty.
 6. Roller Shade Installation: **One (1) year** from date of Substantial Completion, not including scaffolding, lifts or other means to access to the work above 12' Feet AFF, which are the responsibility of others.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: Manufacturer for Window Shade System: Products by Mecho shade; or approved equal.
- B. Requests for substitutions will be considered in accordance with provisions of AIA A201 and Section 00800.

2.2 APPLICATIONS/SCOPE

- A. Roller Shade Schedule:
 1. Shade Type WT-1: Motor operating room visual transparent shade: 1% single roller shades and related motor control systems, mounting systems and accessories as indicated on drawings.
 2. Shade Type WT-2: Manual operating, chain drive, room darkening opaque single roller shades and related mounting systems and accessories as indicated on drawings.
 3. ADA Compliance: All spaces requiring full ADA compliance to be motorized with an accessible wall switch.
 4. CPSC Compliance: All manually operated window coverings with accessible cords, chains, continuous loop cords, etc. shall meet all current Federally mandated CPSC (Consumer Products Safety Commission) safety standards at time of manufacturing. Depending on the product type, additional hardware components may be required and added to meet new regulatory compliant anti-ligature requirements.

2.3 INTELLIGENT ENCODED ELECTRONIC DRIVE SYSTEM

- A. Electronic Drive Unit (EDU):

1. Intelligent Encoded EDU, and Control System: Tubular; or approved equal, asynchronous (non-synchronous) EDU's, with built-in reversible capacitor operating at 120VAC/60Hz, or (230VAC/50Hz) single phase, temperature Class B, thermally protected, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each EDU.
 2. Quiet [42 – 46 db] (within 3 feet open air)
 3. Conceal EDU's inside shade roller tube.
 4. Maximum current draw for each shade EDU of 0.9Amps at 120VAC.
 5. Use EDU's rated at the same nominal speed for all shades in the same room.
 6. Use EDU's with minimum of 34RPM, that shall not vary due to load / lift capacity.
 7. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade EDU and tube assembly.
- B. EDU System: (software, two-way communication): Specifications and design are based on the Intelligent EDU Control System, WhisperShade®IQ® System) as manufactured by MechoSystems; or approved equal. Other systems may be acceptable providing all of the following performance capabilities are provided. EDU and control systems not in complete compliance with these performance criteria shall not be accepted as equal systems.
1. EDU shall support two methods of control
 - a. Local Dry Contact Control Inputs
 - 1) EDU shall be equipped with dry contact inputs to support moving the EDU/shade to the upper and lower limits.
 - 2) EDU shall be equipped with dry contact inputs to support moving the EDU/shade to local switch preset positions.
 - 3) Shall support configuring the EDU under protected sequences so that a typical user would not change the EDU's setup. At a minimum the configuration should include setting limits, setting custom presets and configuring key modes of operation.
 - b. Network Control
 - 1) EDU shall be equipped with a bi-directional network communication capability in order to support commanding the operation of large groups of shades over a common backbone. The network communication card shall be embedded into the tubular EDU assembly.
 2. Upper and lower stopping points (operating limits) of shade bands shall be programmed into EDU's using either a hand held removable program module / configurator or a local switch.
 3. Alignment Positions: Each EDU shall support a minimum of 133 repeatable and precisely aligned shade positions (including limits and presets).
 - a. All shades on the same switch circuit or with the same network group address with the same opening height shall align at each limit or preset (intermediate stopping position) when traveling from any position, up or down.
 - b. Shades of differing heights shall have capability for custom, aligned intermediate stop positions when traveling from any position, up or down.
 - c. Alignment of shades mechanically aligned on the same EDU shall not exceed +/- 0.125 inches (3.175mm) when commanded to the same alignment position.
 - d. Alignment of shades on adjacent EDU's shall not exceed +/- 0.25" inches (6.35mm) when commanded to the same alignment position.
 - e. Local Switch Presets: A minimum of 3 customizable preset positions shall be

accessible over the local dry contact control inputs and over the network connection.

- 1) Upon setting the limits for the shade EDU these preset positions shall automatically default to 25%, 50% and 57% of the shade travel.
 - 2) These positions shall be capable of being customized to any position between and including the upper and lower limits of the shade. A removable program module / configurator or local switch shall be capable of customizing the position of these presets.
- f. Network Presets: A minimum of 29 customizable preset positions (including the 3 local switch presets) shall be accessible via network commands.
- 1) Upon setting the limits for the shade EDU these preset positions shall automatically default to the lower limit unless customized elsewhere.
 - 2) These positions shall be capable of being customized to any position between and including the upper and lower limits of the shade. A removable program module / configurator shall be capable of customizing the position of these presets.
4. Network Control
- a. The system shall have the capability of two-way digital communication with the EDU's over a common backbone.
 - b. Each EDU shall possess 8 addresses capable of being employed for various levels of group control. These addresses shall be configurable via a handheld configurator and/or a PC controller. A 9th unique address shall enable the EDU(s) to be independently controlled and configured over the network via a handheld configurator and/or a PC controller.
 - c. Low Voltage Communication Network Implementation.
 - 1) The low voltage network shall employ a bus topology with daisy chained network connections between nodes over a CAT5 cable (4 UTP) or over a 2 UTP cable employing at least 1 pair at 16 AWG for power and 1 pair at 22 AWG for data.
 - 2) The low voltage network (+/- 13VDC) shall be powered by the nodes attached to it. These nodes could be line voltage powered EDU's attached to 120 VAC or 230 VAC. Alternatively, low voltage nodes shall be powered typically by a centralized low voltage power supply. If a CAT5 network cable is employed and the node draws less than 1W then the node may be powered by DC power supplied by an associated line voltage EDU.
 - 3) Network Capacity: 4000 ft max, 250 nodes max
 1. The number and size of a centralized DC supply shall vary depending upon the network requirements.
5. Operating Modes
- a. Uniform or Normal Modes of Operation:
 - 1) Uniform mode shall allow for shades to only move to defined intermediate stop positions to maintain maximum uniformity and organization.
 - 2) Normal Mode shall allow for shades to move to both intermediate stop positions, plus any position desired between the upper and lower limits as set by the installer.
6. Wall Switches:
- a. Shades shall be operated by 5-2 button low voltage standard switches, or programmable intelligent switches [IS]. Standard switch shall be wired to a bus

interface and the bus interface will be programmed to transmit an address for the local switch.

- b. Intelligent switches may be installed anywhere on the bus line. Each IS shall be capable of storing one control level address to be broadcast along the bus line.
- c. An address that is transmitted by either a switch or central controller shall be responded to by those EDU's with the same address in their control table.
- d. IS shall provide for interface with other low voltage input devices via a set of dry contact terminals located on the switch.
- e. Standard switch or IS may control an individual, sub-group or group of EDU's in accordance with the address in each EDU.

2.4 ROLLER SHADES, MANUAL OPERATION AND ACCESSORIES

- A. Shade System; General:
 1. Components capable of being removed or adjusted without removing mounted shade brackets, or cassette support channel.
 2. Smoothly operation raising or lowering shades.
- B. Basis of Design: UrbanShade, manual operation, as manufactured by Mecho; or approved equal. Fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
 1. Shade Type: Single roller.
 2. Drop Position: Regular. Fabric falls off roller tube, close to glass.
 3. Mounting: Wall mounted.
 4. Size: As indicated on drawings.
 5. Fabric: As indicated under Shade Fabric article.
 6. Roller Tubes: Extruded aluminum. Capable of being removed and reinstalled without affecting roller shade limit adjustments.
 - a. Size: As recommended by manufacturer; for installation conditions, span, and weight of shades.
 - b. Fabric Attachment: Extruded channel in tube accepts vinyl spline welded to fabric edge.
 - 1). Shade Band: Removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
 7. Hembars: Maintains bottom of shade straight and flat.
 - a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
 - b. Room-Darkening Shades: Slotted bottom bar with wool-pile light seal.
 8. Manual Operation:
 - a. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
 - 1). Brake Assembly: Mounted on a low-friction plastic hub with wrapped spring clutch.
 1. Brake must withstand minimum pull force of 25 lbs (12 kg) in stopped position.
 - 2). Clutch/Brake Mounting: On support brackets, independent of roller tube components.
 - b. Drive Chain: Continuous loop beaded ball chain. Upper and lower limit stops.
 - 1). Breaking Force: 45 lbf (200 N) minimum.
 - 2). Chain Retainer per WCMA A100.1: Tensioning device.
 - c. Lift Assist Mechanism: Contained in idler end of roller tube. When hanging weights exceed roller tube weight limits. Manufacturer's standard.

9. Accessories:
 - a. Fascia: Removable extruded aluminum. Size as required to conceal shade mounting. Attachable to brackets without exposed fasteners.
 - 1). Finish: Baked enamel.
 - 2). Color: TBD by Architect
 - 3). Profile: Square.
 - 4). Configuration: Captured, fascia stops at captured bracket end.
- C. Manual Operated Chain Urban Drive Hardware and Brackets:
 1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
 2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
 3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
 4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
 5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
 6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
 7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
 8. Drive Bracket / Brake Assembly:
 - a. MechoShade Drive Bracket model Urban Shade; or approved equal, shall be fully integrated with all MechoShade accessories; or approved equal, including, but not limited to: SnapLoc fascia; or approved equal, room darkening side / sill channels, center supports and connectors for multi-banded shades.
 - b. Urban drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
 - c. The brake shall be an over -running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
 - d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
 - e. The entire Urban assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
- D. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.5 MECHO SHADE BANDS

- A. Shade Bands: Construction of Railroaded shade band includes the fabric, the enclosed hem weight, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable. Note: Each shade band shall cover a max of three (3) lights of glass without any horizontal seam joints.
1. Concealed Hembar: Shall be continuous extruded aluminum for entire width of shade band and with the following characteristics:
 - a. Hembar shall be heat sealed on all sides.
 - b. Open ends shall not be accepted.
 2. Shade band and Shade Roller Attachment:
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection.
 - b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a “snap-on” snap-off” Spline mounting, without having to remove shade roller from shade brackets.
 - c. Mounting Spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
 - d. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets, does not meet the performance requirements of this specification and shall not be accepted.

2.6 ROLLER SHADE FABRICATION

- A. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided Shadecloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design.
- B. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer’s standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the Shade cloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.
- C. For railroaded shade bands, provide seams in railroaded multi-width shade bands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer’s standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shade bands
- D. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer’s standards. In absence of manufacturer’s standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shade bands.
- E. Blackout shade bands, when used inside channels, shall have horizontally mounted, roll-formed stainless steel or tempered-steel battens not more than 3 feet (115 mm) on center extending fully into the side channels. Battens shall be concealed in an integrally colored

fabric to match the inside and outside colors of the shade band, in accordance with manufacturer's published standards for spacing and requirements.

1. Battens shall be roll formed of stainless steel or tempered steel and concave to match the contour of the roller tube.

2.7 ROLLER SHADES, MOTORIZED OPERATION AND ACCESSORIES

- A. Shade System; General:
1. Motorized Shades: Comply with NFPA 70.
 2. Components capable of being removed or adjusted without removing mounted shade brackets or cassette support channel.
 3. Operates smoothly when raising or lowering shades.
 4. Electrical Components: Listed, classified, and labeled as suitable for intended purpose. Test as total system. Individual component testing is acceptable.
 - a. Components: FCC compliant where applicable.
- B. Basis of Design: ElectroShade with WhisperShade IQ2 EDU, as manufactured by MechoShade Systems LLC; or approved equal. Motor operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
1. Voltage: 120 VAC
 2. Description: Single roller.
 3. Drop Position: Regular roll.
 4. Mounting: Recess mounted in ceiling pocket.
 5. Size: As indicated on drawings.
 6. Fabric: As indicated under Shade Fabric article.
 7. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 - a. Material: Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade. Plastic components without use of steel angle construction do not meet the intent of this specification and shall not be accepted. Styrene based plastics, and /or polyester, or reinforced polyester shall not be accepted.
 - b. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
 - c. All bands within a single motor group shall be aligned within 1/4 inch.
 8. Roller Tubes:
 - a. Material: Extruded aluminum.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
 9. Hembars: Designed to maintain bottom of shade straight and flat.
 - a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
 - b. Room-Darkening Shades: Provide a slot in bottom bar with wool-pile light seal.
 10. Accessories:
 - a. Ceiling Pockets: Premanufactured metal shade pocket with removable closure panel, for recess mounting in acoustical tile or drywall ceilings; size and configuration as indicated on drawings.
 1. Removable closure panel.

2. 7/8" ceiling tile support.
 3. Use 2" closure assembly by Mecho or 2" ceiling tile receiver by others in lieu of 7/8" ceiling tile support where applicable by code (i.e.: projects in seismic zones).
- b. Designed to accommodate installation of motor control and wiring accessories within pocket including, but not limited to, line voltage disconnect modular connector, MechoNet Wireless Controller, IQ2 Dual Splitter; or approved equal, and non-plenum rated daisy chain wiring.

2.8 ROLLER SHADE COMPONENTS

A. Access and Material Requirements:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
3. Use only Delran engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester shall not be accepted.

B. Motorized Shade Hardware and Shade Brackets:

1. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade. Plastic components without use of steel angle construction do not meet the intent of this specification and shall not be accepted.
2. Provide shade hardware system that allows for field adjustment of EDU or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the EDU axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade EDU (multi-banded shade, subject to manufacturer's design criteria).
4. All bands within a single EDU group shall be aligned within 1/4 inch.

2.9 WINDOW TREATMENT SCHEDULE

1. Shade Type WT-1: Single Roller Solar shades as shown on referenced Drawings and related EDU control requirements systems. Shades shall have capability of being controlled by wall switch. Include the following as scheduled and as indicated on the Drawings:
 - a. Recessed in ceiling pocket.
2. Shade Type WT-2 Single Roller Black Out Manual Urban Shade as shown on referenced Drawings. Include the following as scheduled and as indicated on the Drawings:
 - a. Surface mounted Snap-Loc Fascia.

2.10 SHADECLOTH

- A. Room Darkening (PVC Free): Mecho Shade, "Chelsea 0250"; or approved equal, .008 inches

thick (.19 mm) blackout material and weighing .94 lbs. per square yard, comprising of 50% polyester, 50% foam finish.

1. 0% Dense open, 118" Wide
2. Color: Selected from Manufacturers standard colors.

B. Visually Transparent Single-Fabric Shade cloth: Mecho Shade, "SoHo Elevate", "1180" Series; or approved equal:

1. Dense Basket Weave "1180" series, 1 percent open, 126" Wide.
2. Color: Selected from Manufacturers standard colors.

2.11 ROLLER SHADE ACCESSORIES

A. Shade Pocket: For recessed mounting in acoustical tile or drywall ceilings as indicated on the drawings.

1. Either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.

B. Snap-Loc Fascia: Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.

1. Fascia shall be able to be installed across two or more shade bands in one piece.
2. Fascia shall fully conceal brackets, shade roller and fabric on the tube.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 SYSTEM STARTUP

- A. Turn-Key Single-Source Responsibility for Interior Roller Shades: To control the responsibility for performance of the electric roller shade system; assign the design, engineering, and installation of electronic drive roller shade control system, shades, addressable controls, communication interfaces, and any required sensors, switches and low voltage control wiring specified in this Section to the manufacturer of the shade and control system.
- B. The Architect will not produce a set of electrical drawings for the installation of control wiring for the electric roller shade control system.
- C. General Contractor responsibilities: GC shall:
 1. Provide power panels and circuits of sufficient size to accommodate roller shade

- manufacturer's requirements, as indicated on the mechanical and electrical drawings and manufacturer's shop drawings.
2. Coordinate with requirements of subcontractor for this section before inaccessible areas are constructed.
 3. Coordinate requirements of ALSCS before inaccessible areas are constructed.
 4. Coordinate with the main building electrical subcontractor to provide duplex 120 VAC power receptacle in Electric closet for floor/riser Communication Gateways.
 5. Verify that wiring conditions, which have been previously installed under other sections or at a previous time, are acceptable for product installation in accordance with manufacturer's instructions.
 6. Comply with manufacturer's product data, including shop drawings, technical bulletins, product catalog installation instructions, and product carton instructions for installation.
 7. Protect installed product and finished surfaces from damage during all phases of installation including preparation, testing, and cleanup.
 8. Be responsible for all other required electrical work including but not limited to roof penetrations, conduits, fireproofing, etc.
 9. Provide conduit with pull wire in all areas, which might not be accessible to subcontractor due to building design, equipment location or schedule.
- D. Window Covering Subcontractor (WC) responsibilities:
1. Shade Control Subcontractor shall furnish and install shade controllers, interfaces, splitters, coupler, sensors, switches, junction boxes, etc mounted in the ceiling in an accessible location. Locations for all visible devices to be coordinated with Architect. The shade control subcontractor shall inspect all material included in this contract prior to installation. Manufacturer shall be notified of unacceptable material prior to installation.
 2. Line voltage wiring
 - a. WC to ROLLER SHADE EDU: The WC shall furnish and install power connection between Shade control system and EDU, and shall be capable of providing single line voltage wire pull for each EDU.
 3. Above-ceiling and concealed wiring to be plenum-rated, or in conduit, as required by the electrical code having jurisdiction.
- E. SHADE POWER WIRING (WC)
1. Shall furnish and install line voltage Cable from roller shade motor into line voltage side of control system.
 2. Shall wire from General Contractor, provided, power junction box to each motor on the shade network.
 3. Shall furnish and install a disconnect plug at the end of the power wiring run to each EDU. The disconnect plug must mate with a matching disconnect plug on the motor cable. EDU cable disconnect plug must be prefabricated by the manufacturer to meet UL and ETL systems requirements.
- F. INTEGRATION TO 3RD PARTY SYSTEMS
1. Main Contractor shall coordinate and provide for others to furnish, install or program any interfaces or wiring to integrate 3rd party systems to the roller shade control system as specified herein. Integration to shade control network can be accomplished locally through dry contact closures, or RS-232.

3.4 INSTALLATION OF ROLLER SHADES

- A. Contractor Furnish and Install Responsibilities:
1. Window Covering Contractor (WC) shall provide an on-site, Project Manager, and shall be present for all related jobsite scheduling meetings.
 2. WC shall supervise the roller shade installation, and setting of intermediate stops of all shades to assure the alignment of the shade bands within a single EDU group, which shall not exceed +/- 0.125 inches (3.175mm), and to assure the alignment between EDU groups, which shall not exceed +/- 0.25" inches (6.35mm).
 3. WC shall be responsible for field inspection on an area-by- area and floor-by-floor basis during construction to confirm proper mounting conditions per approved shop drawings.
 4. Verification of Conditions: examine the areas to receive the work and the conditions under which the work would be performed and notify General Contractor and Owner of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected. Commencement of installation shall constitute acceptance of substrate conditions by the installer.
 5. WC shall provide accurate to 0.0625" inch (1.5875mm); field measurements for custom shade fabrication on the Roller Shades manufacturers input forms.
 6. WC Installer shall install roller shades level, plumb, square, and true according to manufacturer's written instructions, and as specified here in. Blocking for roller shades installed under the contract of the interior General Contractor shall be installed plumb, level, and fitted to window mullion as per interior architect's design documents and in accordance with industry standard tolerances. The horizontal surface of the shade pocket shall not be out-of-level more than 0.625" (15.875mm) over 20 linear feet (6.096 meters)
 7. Shades shall be located so the shade band is not closer than 2 inches (50 mm) to the interior face of the glass. Allow proper clearances for window operation hardware.
 8. Adjust, align and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
 9. Installer shall set Upper, Lower and up to 3 intermediate stop positions of all motorized shade bands, and assure alignment in accordance with the above requirements.
 10. WC shall certify the operation of all motorized shades and turn over each floor for preliminary acceptance.
 11. The WC shall participate and cooperate with the electrical contractor, the window shade manufacturer to verify and certify the installation is in full conformance with the specifications and is fully operational.
 12. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
 13. WC shall train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 12496

PART 4

PLUMBING WORK

SECTION 220010 - GENERAL REQUIREMENTS PLUMBING

TABLE OF CONTENTS

PART 1 - GENERAL REQUIREMENTS PLUMBING

- 1.1 GENERAL
- 1.2 SCOPE AND OBJECTIVES OF THE PLUMBING WORK
- 1.3 INTENT OF THE PLUMBING CONTRACT DOCUMENT
- 1.4 PROPOSAL PREPARATION
- 1.5 HAZARDOUS MATERIALS
- 1.6 DRAWINGS AND SPECIFICATIONS
- 1.7 LAWS, ORDINANCES, REGULATIONS AND PERMITS
- 1.8 TESTS
- 1.9 CLEANING
- 1.10 GUARANTEE
- 1.11 ENTRANCE OF EQUIPMENT
- 1.12 VISIT TO SITE
- 1.13 REQUESTS FOR INFORMATION, RFI(s)
- 1.14 AS-BUILT DRAWINGS
- 1.15 EXCAVATION AND BACKFILLING
- 1.16 CONTINUITY OF SERVICES
- 1.17 CONTINUITY OF INTERIOR BUILDING SERVICE UTILITIES
- 1.18 TEMPORARY FACILITIES, UTILITIES AND HEATING
- 1.19 SMOKE AND FIRESTOPPING (GENERAL)
- 1.20 COORDINATION DRAWINGS
- 1.21 TRADE CONTRACTOR'S CERTIFICATION

PART 2 - PRODUCTS

- 2.1 MANUFACTURER'S AND SUB-CONTRACTORS LIST, KEYMEN RESUMES
- 2.2 SUBMITTALS
- 2.3 MATERIALS AND EQUIPMENT
- 2.4 EQUIPMENT VARIATIONS AND SUBSTITUTIONS
- 2.5 INSERTS, HANGER SUPPORTS, CLAMPS, FASTENINGS
- 2.6 PIPING AND CONDUIT SLEEVES

PART 3 - EXECUTION

- 3.1 METHOD OF PROCEDURE
- 3.2 PROTECTION OF WORK
- 3.3 CUTTING AND PATCHING
- 3.4 CONCRETE AND MASONRY
- 3.5 SUPPORTS
- 3.6 ESCUTCHEONS
- 3.7 PAINTING AND FINISHING
- 3.8 PIPING AND CONDUIT UNDER FLOORS
- 3.9 ABANDONMENT, REMOVAL AND RELOCATION
- 3.10 SUBSURFACE CONCEALED UNKNOWN PHYSICAL CONDITIONS

- 3.11 CONCRETE PATCHING (PROCEDURE)
- 3.12 TEMPORARY PARTITIONS
- 3.13 INITIAL APPLICATION FOR PAYMENT
- 3.14 FINAL APPLICATION FOR PAYMENT
- 3.15 INDEMNIFICATION
- 3.16 ADDITIONAL PLUMBING TRADE CONTRACTOR PAID FEES AND EXPENSES
- 3.17 FORMS

PART 1 - GENERAL REQUIREMENTS PLUMBING

1.1 GENERAL

- A. The conditions of Divisions 00 and 01 apply to each and every Trade Contractor or other person or persons supplying any material or labor entering this building and/or site, either directly or indirectly. In the event of a conflict between Section 220010 and Divisions 00 and 01, the terms of Divisions 00 and 01 shall govern.
- B. One Building Trade, the Plumbing Building Trade, will be covered by these General Requirements Plumbing.
- C. For simplicity, this Building Trade will be referred to further herein as the Plumbing Trade Contractor. The Plumbing Specifications and all Plumbing Drawings, together with all addenda make-up the Plumbing Contract Documents, and are a part of the "Project Contract Documents", as described throughout these specifications.
- D. The term "Electrical Trade" as used in the Contract Documents, means the Electrical Building Trade.
- E. The term "indicated" means all information included, detailed, shown and/or implied on the Contract Documents.
- F. The term "existing" is used generally in reference to renovation projects. On new construction projects, the term "existing" is intended to mean work already in place.

1.2 SCOPE AND OBJECTIVES OF THE PLUMBING WORK

- A. Scope of work includes, but is not limited to, the following:
 - 1. Submittals including product data, shop drawings and samples;
 - 2. Removal of selected plumbing piping and accessories;
 - 3. Piping, insulation and valves;
 - 4. Preparation of coordination drawings;
 - 5. Preparation of as-built drawings in AutoCad format;
 - 6. Periodic inspection of completed work to confirm compliance with Contract Documents;
 - 7. Refer to Division 01 Section "Summary" for additional information.

1.3 INTENT OF THE PLUMBING CONTRACT DOCUMENT

- A. The intent of the Plumbing Contract Documents is to include all items and labor necessary for the proper execution and completion of the Work of the Plumbing Trade Contractor. The Contract Documents of all Trades are complimentary to each other; what is required by one shall be as binding as if required by all. Performance of the Plumbing Trade

Contractor is required only to the extent consistent with the Project Contract Documents and reasonably inferable from them as being necessary to produce the desired results.

- B. It is expressly stipulated that neither the Drawings nor the Specifications shall take precedence over the other, and it is further stipulated that the Architect/Engineer may interpret or construe the Drawings and Specifications so as to secure in all cases the result most consistent with the needs and requirements of the work. In the event of such ambiguity or discrepancy, comply with the higher cost product (material plus labor), the more stringent requirement, and supply the better quality or greater quantity of work.

1.4 PROPOSAL PREPARATION

- A. Prior to submitting a pricing quotation/proposal, proceed as follows, and include the following:

1. Visit the site, survey, record, confirm and include in the scope of work, all material and labor necessary to install the equipment and systems indicated. Use the Contract Documents as diagrammatic in nature, since they are not intended to show all details which may affect the plumbing bid proposal.
2. Include the work, as applicable, to remove and dispose of plumbing piping, insulation and appurtenances, not required for new work, unless otherwise indicated to be abandoned in place.
3. Include all disconnections, removals and temporary provisions required to permit rigging, installation, connection, testing and operation of the new equipment. Include all such provisions whether or not shown, detailed or specified within technical sections of the Contract Documents.
4. Include in the work, providing the labor of Keymen, including, but not limited to the following:
 - a. One Project Manager;
 - b. One Project Foreman.
5. Foreman must refine the detail, layout, coordination and fit of all of the plumbing piping. Plan all disconnections, removals, offsets, temporary provisions, as required, to fit the new piping into the space, and as required to accommodate maintenance accessibility and service access.
6. Project Manager must maintain and submit for approval, a written project schedule, on a weekly basis.
7. All Project Managers must organize, administrate, control and log the RFI process for their respective trade. Where applicable, submit all RFI(s) for master RFI log maintained by Lead/Prime Contractor.

- B. In preparing a Bid Price:

1. Thoroughly review and confirm all existing conditions and Contract Document information. Make note in writing of any exceptions, misunderstandings, unclear areas, unclear directions, and any aspects which will prohibit completion of the work, in total. Failing to supply such notice, all bidders will be accountable for having accepted all conditions at the site which affect their work and their costs. By

submitting a bid price, all Trade Contractors certify that the Contract Documents have been thoroughly reviewed and are sufficient for construction, and that the bidding Trade Contractors have adequate information to establish and determine their responsibility for materials, methods, costs, and schedule for their work.

2. Incorporate all requirements of all sections of the Contract Documents.
3. Include the following with the Manufacturer's and Sub-Contractor's Lists:
 - a. The name and telephone number of all Sub-Contractors.
 - b. The manufacturer and model numbers of all equipment proposed by the bidder and as listed on all of the equipment schedules and specified in the Contract Documents.

1.5 HAZARDOUS MATERIALS

- A. The use of asbestos, PCB's or any material or product containing hazardous materials in the performance of this contract is not permitted. Certify, in writing, that no hazardous material or product containing a hazardous material, has been furnished or installed.

1.6 DRAWINGS AND SPECIFICATIONS

- A. It is the intent of the specifications and drawings to include under each item all materials, apparatus and labor necessary to properly install, equip, adjust and put into perfect operation the respective portions of the installations specified and to so interconnect the various items or sections of the work as to form a complete and properly operating whole.
- B. Any apparatus, machinery, small items not mentioned in detail which are necessary to complete or perfect any portion of the installation in a substantial manner and in compliance with the requirements stated, implied or intended must be furnished and/or installed without extra cost to the Project. This includes all materials, devices or methods peculiar to the machinery, apparatus or systems furnished and/or installed by the Plumbing Trade Contractor.
- C. In referring to drawings, figured dimensions take precedence over scale measurements. Verify all wall locations, ceiling heights, elevations, dimensions, etc. on the architectural drawings, where applicable. Discrepancies must be referred to the Engineer for decision. Certify and verify all dimensions, routings and layouts in the field and on the coordination drawings before ordering material or commencing work.
- D. Any work called for in the specifications, but not mentioned or shown on the drawings, or called for on the drawings, but not mentioned in the specifications, must be furnished and/or installed as though called for in both.
- E. When any device or part of equipment is herein referred to in the singular number, such as "the pump" such reference is deemed to apply to as many such devices as required to complete the installation.
- F. The term "Provide" means "Furnish and Install". Neither term will be used generally in these specifications, but will be assumed. The term "Furnish" means to obtain and deliver to the job site for installation by other trades.

1.7 LAWS, ORDINANCES, REGULATIONS AND PERMITS

- A. The entire plumbing system in all and/or in part must conform to all pertinent laws, ordinances and regulations of all bodies having jurisdiction, notwithstanding anything in these drawings or specifications to the contrary.
- B. Pay all fees and obtain and pay for all permits and inspections required by any authority having jurisdiction in connection with the work under this contract.
- C. Electrical work performed by the Plumbing Trade Contractor must comply with the requirements of the National Electrical Code, NFPA and other boards and departments having local jurisdiction.

1.8 TESTS

- A. The following requirements are supplementary to tests specified for individual equipment or systems in other specification sections. Give written notice of date of test in ample time to all concerned.
- B. Concealed or insulated work must remain uncovered until all required tests have been completed; but if construction schedule requires, arrange for partial tests on portions of systems as approved. If a Prime Contractor covers or directs a Sub-Contractor to cover plumbing work prior to completing the required tests, the Prime Contractor is responsible for any additional costs related to completing the required tests.
- C. As soon as conditions permit, conduct preliminary tests of equipment to ascertain compliance with specified requirements. Make needed changes, adjustments and/or replacements as preliminary tests may indicate, prior to acceptance tests.
- D. Conduct pressure, performance and operating tests as specified or required for each system or piece of equipment installed, modified or affected under this contract in presence of the Engineer or Owner as well as a representative of agencies having jurisdiction.
- E. Obtain Certificates of Approval and/or Acceptance as specified or required in compliance with regulations of agencies having jurisdiction. Work will not be deemed complete until such Certificates have been delivered to the Engineer.
- F. Prove conclusively, by testing, that Plumbing systems operate properly, efficiently and quietly in accordance with intent of drawings, specifications and most widely used construction practices.

1.9 CLEANING

- A. Be responsible for the following:
 - 1. Removal of all lumber, refuse, metal, piping and debris from site resulting from plumbing work.

2. Cleaning drippings created by the plumbing work, from finished work of other Trades.

1.10 GUARANTEE

- A. All material, equipment and workmanship must be in first class operating condition in every respect at time of acceptance by Owner. Acceptance by the Owner will be by letter written to the Plumbing Trade Contractor.
- B. Unconditionally guarantee in writing all materials, equipment and workmanship for a period of one (1) year from date of acceptance by Owner. During the guarantee period, repair or replace, at the Plumbing Trade Contractor's expense, any materials, equipment or workmanship in which defects may develop and provide free service for all equipment and systems involved in the contract during this guarantee period. Beneficial use of any system by the any of the Trade Contractors during construction does not constitute acceptance by the Owner. Time period of this beneficial use cannot be included in the guarantee period.
- C. Guarantee must also include restoration to its original condition of all adjacent work that is disturbed in fulfilling this guarantee.
- D. All such repairs and/or replacements must be made without delay and at the convenience of the Owner.
- E. Guarantees furnished by Trade Contractors and/or equipment manufacturers must be counter-signed by the related Trade Contractor for joint and/or individual responsibility for subject item.
- F. Manufacturers' equipment guarantees or warranties extending beyond the guarantee period described in item B above must be transferred to the Owner along with the Trade Contractor's guarantees.

1.11 ENTRANCE OF EQUIPMENT

- A. Determine the method of equipment entrance during initial site visit prior to bidding. Do not scale building openings, door widths, and equipment or component sizes off the drawings. Determine sizes from site measurements and the equipment manufacturer. Include cost of equipment manufacturer's knockdown, use of field assembled equipment, field assembly, all work required for access, removals, replacements, general construction, and the like, as required. During preparation of submittals, verify whether knocked-down or pre-disassembled equipment have been proposed all to the extent required to permit entry of equipment to final location. Verify that the use of field assembled (not pre-assembled) equipment complies with manufacturer's warranty, guarantee, listings and requirements.
- B. Perform all necessary rigging required for completion of plumbing work.

- C. Deliver products to the site properly identified with names, model numbers, types, grades, compliance labels and other information needed for identification. Deliver products and equipment to the site properly weatherproofed.
- D. The Trade Contractor who furnishes or purchases the product or equipment is responsible to provide and maintain protection from the weather, dust, dirt, construction debris, etc. until the project is complete.
- E. For all products and equipment which, when installed, have an opening into the building must be provided with a plywood cover, or similar protection, to prevent debris, rain, etc. from entering the building. The Trade Contractor who installs the product or equipment is responsible for such protection beginning at the time of installation.

1.12 VISIT TO SITE

- A. Due to the nature of the work involved under these Contract Documents, all bidders are recommended to thoroughly examine the site. Coordinate and schedule all site visits with the Owner.
- B. Thoroughly review Contract Documents prior to visiting the site, take Contract Documents to site and thoroughly explore to any extent necessary, the existing conditions as relating to fulfilling the requirements of these Contract Documents.
- C. If discrepancies are noted between requirements of Contract Documents and existing conditions, Trade Contractors must so indicate to Engineer during bidding period and receive clarification before bidding. Failure to comply with this requirement will result in Engineer's interpretation during the construction period such that the Engineer's decision will be final and binding as the sole interpreter of the contract requirements.
- D. Extras will not be considered for any work relating to connections with existing systems or adaptability of new systems to existing structures.
- E. Submission of proposals will be considered evidence that Trade Contractors have complied with the requirements of this Article.

1.13 REQUESTS FOR INFORMATION, RFI(s)

- A. Manage RFI(s) in a formal manner. Preparation and submission must comply with the process specified herein to be of maximum benefit to the project. RFI(s) which do not comply with this process will be returned without comment.
- B. All RFI(s):
 - 1. Must be submitted in written form to the party designated at the construction phase kick-off meeting;
 - 2. Must be consecutively numbered, dated, and logged as directed, during the kick-off meeting;
 - 3. Those which are follow-up RFI(s), must use the same RFI number, with a sequential submission number;

4. Must list the RFI number of any reference RFI(s) used in the narrative;
 5. Must present: background; related drawings; specification articles; room, space locations (as designated on Contract Documents including wing, column line designation, floor designation, and/or north, south, and the like), and must be presented as complete, clearly written thoughts, in legibly printed or typed form;
 6. Must be completed by the Plumbing Trade Contractor's Designated Project Foreman, under the control and overview of the Plumbing Trade Contractor's Project Manager;
 7. Must include Plumbing Trade Contractor's Project Foreman's suggested resolution to RFI;
 8. Must evidence a high level of fluency with the Contract Documents, all job progress correspondence, all Addenda, all Construction Bulletins, and specifically the Plumbing/Electrical Specifications including: Section 210010; the sections of Division 22; Division 23; Division 26; and special system and equipment divisions of the specification Divisions 02 thru 33 inclusive.
- C. The Plumbing Trade Contractor's designated Project Manager must demonstrate familiarity with and responsibility for all RFI(s) prepared by the Project Foreman and must periodically submit an initialed log of RFI(s) signifying control of RFI(s) relating to specification and job scope issues.
- D. Issues relating to job scope, work included, methods and means which are either clearly discernable from the Contract Documents and/or clearly the responsibility of the Plumbing Trade Contractor must be answered by Plumbing Trade Contractor's Project Manager and resolved between the Foreman and Project Manager prior to resorting to written RFI(s). The work of the Project Manager must evidence: fluency with the methods and means anticipated by the Plumbing Trade Contractor during the bid phase to plan and complete the work; fluency with the Contract Documents, and all administrative issues related thereto.
- E. Items or issues which relate to non-compliance to associated codes or regulations must reference code interpretations or the published adopted code or regulation. The reference must be either an excerpt of the code or regulation, published addenda to the code or regulation, a formal interpretation written by a representative of the associated agency, or letter of non-compliance from the Authority Having Jurisdiction. All cited code requirements must include the applicable code title, code version or date, and code section number designation. If the RFI does not contain the required information, the RFI will be returned without comment.

1.14 AS-BUILT DRAWINGS

- A. Prepare reproducible (paper) and electronic (cd) record documents in AUTOCAD .dwg format (Version 2000 or later) in accordance with the requirements in Division 01. Use commercial CAD drafting service if Plumbing Trade Contractor does not have CAD capabilities in-house. As an option, if requested by the Plumbing Trade Contractor, an electronic copy (AutoCad .dwg format) of any of the Plumbing Contract Drawings may be provided by the Engineer at a cost of \$55.00, billable to the requesting Contractor. In addition to the requirements specified in Division 01, indicate the following installed conditions:

1. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, and the like). Valve location diagrams, complete with valve tag chart. Indicate actual inverts and horizontal locations of underground piping, and the like.
 2. Equipment locations (exposed and concealed), dimensioned from prominent building lines and annotated with permanent equipment number approved by Owner. Include Code and equipment service clearances.
 3. Approved substitutions, Addenda and Bulletin Contract Modifications, and actual equipment and materials installed
- B. Engage the services of a Land Surveyor or Professional Engineer registered in the state in which the project is located, as specified in Division 01, to record the locations and invert elevations of the underground plumbing work.

1.15 EXCAVATION AND BACKFILLING

- A. Perform all excavation, backfilling and pumping necessary for completion of plumbing work. All excavation is considered classified.
- B. Remove from premises or deposit as directed by Engineer all material excavated and not required or suitable for backfilling.
- C. Carefully remove and store topsoil, shrubbery and sod until underground work is complete and trenches are backfilled and then re-install. Replace any damaged items to the satisfaction of the Engineer.
- D. Allow adequate cover over piping and conduit in trenches as applicable. Trench walls must be perpendicular to the top of piping and conduits and trench bottoms must be instrument graded in the direction of flow as required. Earth must be scooped out under pipe hubs to provide a solid bearing for the pipe, duct or conduit on undisturbed earth. Cinder fill, stones or bricks beneath piping are prohibited. Pipe, and conduits less than 6-inches in outside diameter which do not require sloping, shall have hard trench bottoms and shall be supported on undisturbed subgrade. Trench bottoms for sloping utilities, pipes, and conduits over 6-inches in outside diameter shall be excavated 6-inches deeper than elevation and a 6-inch thick tamped bedding shall be installed. Bedding shall be naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- E. Provide sheathing, shoring and bracing necessary to complete excavation and backfilling work and exercise every precaution necessary to prevent accident, injury or death to any human and damage to property of others. Remove all debris, sheathing, shoring and bracing upon completion of work.
- F. It is the responsibility of each Trade Contractor to check with the various Utility Companies and make the necessary arrangements to avoid damage to their property. Each Trade Contractor is responsible for damage during excavation to existing underground structures including, but not limited to electric, structural, piping or

equipment. Such damage must be repaired promptly without cost to the Project. Do not dig until all underground utilities are identified and located.

- G. Backfill after inspection and approval. Backfill must be made with clean earth, free from rocks, frozen particles, debris or other foreign materials. Deposit in uniform layers not over six inches (6") thick with each layer mechanically tamped before the next layer is applied. When approved backfill material is not available from the site, each Trade Contractor, at no additional cost to the project, must provide additional select backfill to complete installation. Partial backfill on piping leaving all joints exposed is mandatory for all underground gas and underground domestic water systems. Final backfill only after testing procedures have been approved.
- H. All trenches that pass under wall foundations must be backfilled with lean concrete, full height, directly under wall footing, and at a 1:1 slope away from wall or column footing. Trenches that are parallel with and deeper than wall foundations must be backfilled with lean concrete on a 1:1 slope away from the bottom of the wall or column footing.
- I. Perform all cutting and patching to driveways, sidewalks, curbs, bituminous paving, walls, and the like, required by performance of excavation and backfilling. Install and maintain temporary paving as directed by Engineer. Make repairs to sidewalks in complete blocks, partial patching will not be acceptable. Provide all materials for patching in strict accordance with applicable Articles of Divisions 01 through 33 of the Contract Specifications. All patching to match adjacent construction.
- J. Where rock is encountered during installation of underground piping systems, carry trenches to a point six inches (6") below invert of pipe and provide a six inch (6") layer of crushed stone or gravel as a cushion.
- K. All excavation work must include all pumping equipment, materials and labor necessary to keep all excavations free of water. Provide well points as required with disposition of water as directed by Architect/Engineer.
- L. Provide suitable indemnity for all accidents to humans, animals or equipment caused by excavating and backfilling work. Provide suitable guards, barricades, red lanterns, flares and take the necessary precaution for an approved and safe installation. All trenches must be backfilled at the end of each working day. Where a trench must be left open, provide coverings of adequate size and strength over entire open area.
- M. Detectable Warning Tape: Acid and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6-inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil and dangerous materials.
 - 3. Blue: Water systems.
 - 4. Green: Sewer systems.

- N. Trade Contractors shall engage the services of a Utility Identification Sub-Contractor to identify all existing underground utilities in the path of the proposed trench excavation. It shall be the Utility Identification Sub-Contractor's sole responsibility to search, investigate, test and identify existing underground utilities such as, but not limited to the following: gas piping, water piping, steam piping, condensate piping, electrical lines, sanitary piping, storm water piping, data, telephone, fiber optics and any other utility service, piping, lines or trenches. Before excavation can begin, the Trade Contractors shall provide all utility data concerning the underground utilities to Design Professional, and Owner. Data shall be in the form of a scaled drawing of the proposed excavation with all utilities clearly indicated.

1.16 CONTINUITY OF SERVICES

- A. Generally, no actions can be taken by the Plumbing Trade Contractor that will interrupt any of the existing building services for these buildings or any other building until previously arranged and scheduled with the Engineer and Owner.
- B. Should any service be interrupted by the Plumbing Trade Contractor, immediately provide all labor, including overtime if necessary, and all material and equipment necessary for restoration of such service, at no additional cost to the Project.

1.17 CONTINUITY OF INTERIOR BUILDING SERVICE UTILITIES

- A. For the purposes of this specification section, "Building Service Utilities" include, but are not limited to:
 - 1. Exterior: electrical; domestic water; fire protection water; sanitary; storm; chilled water; space heating water; fuel lines; communication cable; fire alarm; remote metering lines; telemetry lines; and the like;
 - 2. Heating piping systems, complete;
 - 3. Chilled water piping systems, complete;
 - 4. Heating and process steam/condensate systems, complete;
 - 5. Ductwork systems, complete;
 - 6. Medical gas systems, complete;
 - 7. Fire protection systems, complete;
 - 8. Control systems, complete;
 - 9. Plumbing, drainage and storm systems, complete;
 - 10. Process piping systems, complete;
 - 11. Electrical conduit and wiring systems, complete;
 - 12. Electrical lighting and wiring devices, complete;
 - 13. Electrical fire alarm and security systems, complete;
 - 14. Electrical communication systems, complete.
- B. Building Service Utilities are defined for the purposes of this project, and as used in these specifications as:
 - 1. TYPE A Utility System Services. New Internal Building Services, serving: new and/or modified system functions; new and/or modified equipment;

2. TYPE B Utility System Services. Existing Internal Building Services serving: unmodified systems; unmodified equipment; building spaces for which mechanical and electrical systems, and internal operational equipment have not been modified by this project;
 3. TYPE C Utility System Services. Existing Utility Systems Building Services, external to the individual building, or buildings, addressed by the work of this project;
 4. TYPE D Utility System Services. New Utility Systems Building Services, external to the individual building, or buildings, addressed by the Work of this project.
- C. Plan work and schedule to prevent interruption of TYPE B, and/or TYPE C Utility System Services. Refer to the "Scope and Objectives of the Plumbing Work," of this Section for a description of: unmodified systems, unmodified equipment; spaces wherein mechanical and electrical systems are unmodified; and Utility System Services external to the individual building or buildings addressed by the work of this project.
- D. Plan work and schedule installation and connections of TYPE A and TYPE D Utilities to minimize or prevent interruption of TYPE B, and or TYPE C Utility System Services. Refer to "General Requirements Plumbing," Article "Scope and Objectives of the Plumbing Work."
- E. The work required for continuity of these systems on this project includes, but is not limited to, providing all labor and material required for: site investigation/verification; disconnect; removal; rerouting; reconnection; as-built drawing documentation; testing and check out of mechanical and electrical services serving equipment which are implied to be, or specifically indicated to be, continued in operation.
- F. All materials required for relocation work must comply with these specifications. Carefully review all phasing drawings, all Construction Trade drawings, and complete all necessary and prudent site visits to become familiar with all existing building operations, systems and equipment which may be continued, independent of the work of this project, and include all required relocation work described in this section.

1.18 TEMPORARY FACILITIES, UTILITIES AND HEATING

- A. Refer to Division 01 of these specifications.

1.19 SMOKE AND FIRESTOPPING (GENERAL)

- A. Furnish and install a material or a combination of materials to form an effective barrier against the spread of flame, smoke and gases, and to maintain the integrity of the "fire and/or smoke" rated construction. Refer to Division 07 of these specifications. Fire and smoke rated construction is identified on the Architectural Drawings. Provide firestopping in the following locations:
1. Pipe and conduit penetrations through above grade floor slabs and through "fire and/or smoke"-rated partitions and fire walls.
 2. Penetrations of vertical shafts including, but not limited to pipe chases, duct chases, elevator shafts, and utility chutes.
 3. Other locations where indicated or required.

- B. Prepare submittals and submit for approval. Include manufacturer's descriptive data, typical details, installation instructions and the fire/smoke test data and/or report as appropriate for the time rated construction and location. The fire/smoke test data must include a certification by a nationally recognized testing authority that the material has been tested in accordance with ASTM E 814, or UL 1479 fire tests.
- C. Deliver materials in the original unopened packages or containers showing name of the manufacturer and the brand name. Store materials off the ground, and protect from damage and exposure to elements. Damaged, deteriorated or outdated shelf life materials shall not be used and must be removed from the site.

1.20 COORDINATION DRAWINGS

- A. The Contractor will initiate preparation of coordination drawings, control original reproducibles, collect, organize and facilitate the work/input of General Construction Trade Contractor and all other building trades, as applicable, relative to the 100% final submission of the coordination drawings. Coordination drawings will be prepared in accordance with Division 01, to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of equipment and materials in relationship with other systems, installations, and building components. Use proposed equipment submittals, which include certified dimensions, service clearances, etc., to assist in preparation of the coordination drawings. If equipment is submitted for review after completion of the coordination drawings and rejected during the submittal review process, because the equipment fails to meet the project specifications, the Trade Contractor is responsible to revise the coordination drawings and layout the work using equipment which meets the project specifications. Trade Contractor will designate all specified return air plenums, locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Proposed locations of piping, ductwork, equipment, and materials. The following shall be included:
 - a. Clearances for installing and maintaining insulation.
 - b. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
 - c. Equipment connections and support details.
 - d. Exterior wall and foundation penetrations.
 - e. Fire-rated wall and floor penetrations.
 - f. Sizes and location of required concrete pads and bases.
 - g. Valve stem movement.
 - h. Service clearance for equipment behind access doors.
 - i. Location of structural columns, beams and supports.
 - 2. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
 - 3. Floor plans, elevations, and details to indicate penetrations in floors, walls and ceilings and their relationship to other penetrations and installations.

4. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling mounted items.
 5. The foregoing information and coordination work must be provided by the applicable Trade Contractor using the coordination drawings as initiated by the Trade Contractor.
 6. The Trade Contractor must submit completed coordination drawings for record purposes, not for technical review and approval, but as proof that the coordination drawings have been completed. The coordination drawings must be completed and submitted for record in advance of submission of sheet metal shop drawings.
- B. Coordinate with, and provide the Trade Contractor, all plumbing system and equipment information, locations, and clearances required, to prepare the coordination drawings.

1.21 TRADE CONTRACTOR'S CERTIFICATION

- A. Upon final completion of all work, each Trade Contractor must provide a notarized letter on Corporate letterhead, executed by a Corporate Officer, or Company Partner, stating that the work has been completed in accordance with the Contract Documents, Addenda, Bulletins, Trade Contractor's Punch List items and Architect's/Engineer's Construction Observation Report(s). Final Payment will not be approved until the notarized letter has been provided. Refer to the following sample letter.

SAMPLE LETTER

ENGINEER/ARCHITECT _____

TRADE CONTRACTOR _____

PROJECT _____ NO. _____

I hereby certify that all work under the HVAC, Plumbing, Fire Protection and Electrical Contract Documents, as applicable, including all addenda, bulletins, Punch List items and Construction Observation Reports, has been completed and the quality and workmanship of the work has been performed in accordance with Contract Documents.

State of: _____

County of: _____

Trade Contractor:

Subscribed and Sworn to before
me this _____ day of
20 ____

Notary Public:

By: _____

My Commission Expires:

Date: _____



1.22 CONNECTIONS TO EXISTING SYSTEMS

- A. Work under this contract may require connections to existing domestic water systems. Include in the bid, all material and labor necessary to perform the following work:
 - 1. Drain the system to level necessary to complete the work;
 - 2. Fill the system to original fill pressure while venting excess air from the system.

PART 2 - PRODUCTS

2.1 MANUFACTURER'S AND SUB-CONTRACTORS LIST, KEYMEN RESUMES

- A. Before ordering any material or equipment unit, and not later than ten (10) working days after signing of contracts, submit a list of Manufacturers, Sub-Contractors and Suppliers showing make, type, manufacturer's name and trade designation of all materials, and equipment, proposed for use under this contract. Prepare list by reference to

specifications. Identify all long lead submittals which will require an expedited submittal review.

- B. Refer to the Article "Proposal Preparation," in this section. Specifically designate the labor force required of the Plumbing Trade Contractor. As part of the mobilization phase of the work, submit resumes for each Keyman including the Project Manager and Project Foreman.
- C. These lists, when approved, will be supplementary to specifications, and no variations therefrom will be permitted except with the approval of the Engineer.
- D. Prepare the list using the "PROPOSED MANUFACTURERS AND SUB-CONTRACTORS LIST" located at the end of this section.
- E. Submittals will not be processed until the requirements of this Article are satisfactorily completed.

2.2 SUBMITTALS

- A. Provide digital submissions (.pdf format) for all material and equipment as noted in Proposed Manufacturer's and Sub-Contractors List, except where indicated otherwise herein.
 - 1. Prior to submission of product data, shop drawings, and samples, notify the Engineer/Architect of any site conditions differing from those indicated or specified.
 - 2. Prior to submission of product data, shop drawings and samples to the design professional, the Plumbing Trade Contractor shall submit all submittals which require electrical power to the Project Electrical Trade Contractor for the Plumbing Trade Contractor's and Electrical Trade Contractor's coordination and review. Electrical Trade Contractor shall provide approval of electrical power requirements for the Plumbing Trade Contractor's proposed equipment.
 - 3. All submittals of equipment requiring electrical power must be accompanied by the "PLUMBING AND ELECTRICAL CONTRACTORS' COORDINATION OF PLUMBING EQUIPMENT ELECTRICAL REQUIREMENTS TRANSMITTAL COVER SHEET" located at the end of this section. Submittals without this Cover Sheet or an incomplete Cover Sheet will be rejected without review.
 - 4. All submittals must be accompanied by the "PLUMBING CONTRACTOR'S TRANSMITTAL COVER SHEET" located at the end of this section. Submittals without this cover sheet or with an incomplete cover sheet, will be rejected without review.
 - 5. All submittals must be accompanied by the "PLUMBING SUBMITTAL LOG", located at the end of this section. Submit log after final acceptance of the proposed Manufacturer's and Sub-Contractor's list. Revise and update the log with each submittal. Submittals without these logs or without an updated log will be rejected without review.
 - 6. Specifically annotate and sign all exceptions, deletions and additions that vary from the Project Contract Documents. Failing to provide signed annotations for all deletions and additions, recognize and accept that Contract Documents will govern, and will be used to resolve disputes.

- B. Prepare submittals by careful reference to: drawings and specifications; preparatory layout of all work; coordination with all proposed equipment; coordination with related submittals and the work of all other Trade Contractors; space requirements; and TYPE A, TYPE B, TYPE C, and TYPE D Utilities defined in this Section. A review of such submittals by the Engineer/Architect, which include drawings, schedules, and catalog cuts provided by the Trade Contractors, their Sub-Contractors, manufacturers, and vendors, shall not relieve the Trade Contractors from the responsibility for correcting all errors of any sort in the submittals, either identified or undetected by such review.
- C. Regularly provide and update submittal log sheets listing submittal number, product, applicable specification section, dates of submittal and receipt and status. Identify each submittal by Job Name, log number and reference to applicable Specification Article number.
- D. Review Time:
 - 1. Allow two (2) weeks after Engineer's receipt for the Engineer's processing of each submittal, exclusive of Owner's, or other's review in the processing chain. Allow a longer time period where processing must be delayed for coordination with subsequent submittals.
- E. The Engineer's recommendation of acceptance of the equipment proposed by the Plumbing Trade Contractor is conditional upon the Plumbing Trade Contractor fulfilling all obligations of the Contract Documents. By furnishing the proposed equipment, the Plumbing Trade Contractor acknowledges compliance with all of the following:
 - 1. Field layout is completed and planning of proposed equipment has coordinated with all related submittals, related trades and space requirements.
 - 2. The Plumbing Trade Contractor has reviewed and approved all submittals prior to submission. Provide all submittals with a signed approval stamp, signifying the following: 1) all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data have been verified; 2) the Engineer/Architect has been notified of all site conditions which affect the work, and which require design resolution, as opposed to resolution by trade decisions; 3) all items are approved by the Plumbing Trade Contractor, and have been coordinated and checked with other applicable submittals, and contract requirements; 4) submission is clearly marked to indicate which manufacturer's options are provided and which are not provided for the proposed equipment; and 5) manufacturers and/or equipment suppliers have been given a set of the contract documents for their review and use as the basis of the submittals.
 - 3. Any and all exceptions requested by the Plumbing Trade Contractor are provided in writing with the submittals. All exceptions, deletions and additions that vary from the Contract Documents have been specifically annotated and initialed. Failing to provide initialed annotations for all deletions and additions, the Plumbing Trade Contractor accepts the condition that the Contract Documents will govern, and will be used to resolve disputes.
 - 4. Submittals without the Plumbing Trade Contractor's signed stamp of approval will be returned without review. Initialed approval stamps are not acceptable.
 - 5. The Engineer's acceptance of the proposed equipment constitutes the Engineer's formal approval that the engineering performance and operational utility

requirements, of the proposed equipment, match the Engineer's specified and designed performance requirements. By entering into these Contracts, the Trade Contractors agree that the purpose of submittals is to demonstrate to the Engineer that the Trade Contractors understand the design concept and that they demonstrate their understanding by indicating which materials and equipment they intends to furnish, install and use.

- F. Secure submittals smaller than 8-1/2 x 11 to paper of this size.
- G. Material and equipment fabricated, furnished and/or installed or used without the Engineer's review are subject to rejection by the Engineer.
- H. Corrections or comments made on submittals during review by the Engineer do not relieve the Plumbing Trade Contractor from compliance with the requirements of the Contract Documents. Such review will be only for general conformance with the design concept, and the information given in the Contract Documents and does not include review of quantities, dimensions, sizing, pressure drops, weights or gauges, fabrication processes, construction methods, coordination with the work of other trades, or construction safety precautions, all of which are the sole responsibility of the Plumbing Trade Contractor. Review of a specific item does not indicate acceptance of an assembly of which the item is a component. The Engineer is not responsible for any deviations from the Contract Documents that are not clearly noted by the Plumbing Trade Contractor. The Engineer will not review partial submissions or those for which submissions for correlated items have not been received. The Plumbing Trade Contractor is responsible for: confirming and correlating all quantities, clearance, and dimensions; selecting fabrication processes and techniques of construction; coordinating work with all other Trades, and performing his work in a safe and satisfactory manner.
- I. All submittals must be able to be reproduced. The Plumbing Trade Contractor is responsible for all reproduction and distribution to the General Construction Trade Contractor and all other Trade Contractors as applicable.
- J. If requested for the Plumbing Trade Contractor's use in the preparation of submittals, an electronic copy (AutoCad .dwg format) of any of the Plumbing Contract Drawings may be provided by the Engineer, after receipt of a signed indemnification agreement, at a cost of \$55.00, billable to the Plumbing Trade Contractor.
- K. For additional requirements regarding submittals, refer to Article "Additional Trade Contractor Paid fees and Expenses" in Part 3 of this section.

2.3 MATERIALS AND EQUIPMENT

- A. All materials and equipment must be new and conform to the grade, quality and standards specified herein.
- B. All equipment offered under these specifications is limited to products regularly produced and recommended for service ratings in accordance with engineering data or other comprehensive literature made available to the public and in effect at the time of opening of bids. Testing agency seals, decals and/or nameplate shall be attached to and visible on all equipment.

- C. Items such as valves, motors, starting equipment, vibration isolating devices, and all other equipment and material, where applicable and practicable, must each be of one manufacturer.
- D. Install equipment in strict accordance with manufacturer's instructions for type and capacity of each piece of equipment used. Obtain these instructions, which will be considered part of these specifications. Type, capacity and application of equipment must be suitable and operate satisfactorily for the purpose intended in the plumbing systems.

2.4 EQUIPMENT VARIATIONS AND SUBSTITUTIONS

- A. Equipment Substitution Definition as follows:
 - 1. A product that is neither the Basis of Design, nor one of the named Alternative Manufacturing Sources.
 - 2. Unless noted otherwise in the Contract Documents, substitutions may be considered after the award of Contracts. Subsequent requests will be considered only when, through no fault of the Plumbing Trade Contractor, none of the specified products are available.
- B. Equipment Variation Definition as follows:
 - 1. A product that is not the Basis of Design, but is named as one of the specified Alternative Manufacturing Sources.
- C. The manufacturers listed in Part 2 of all technical specifications are considered Alternative Manufacturing Sources as described in Paragraphs A and B above.
- D. "Subject to compliance", as used in these specifications, means compliance with all the requirements of the Contract Documents.
- E. The materials and products mentioned in these Contract Documents are specified to establish a standard of: material of manufacture; independent testing agency certifications; quality; function; design; and performance. The phrases "Basis of Design," "standard of design," and "equivalent acceptable," are used to indicate that other similar, comparable products may be used provided such substitutes or variations are accepted by the Engineer as meeting all the salient characteristics and standards necessary, such as: material of manufacture; independent testing agency certifications; quality; function; design; and performance, to meet the Owner's needs and meet the objectives of the Engineer's Project Design.
- F. Where Alternative Manufacturer Sources are listed for an item:
 - 1. Selection must be either the Basis of Design or one of those listed Alternative Manufacturing Sources.
 - 2. There is no guarantee implied that each and every manufacturer listed can meet or exceed the salient characteristics, such as: material of manufacture; independent testing agency certifications; quality; function; design; and performance of the product specified as Basis of Design.

- G. Each Trade Contractor is responsible to contact his proposed equipment manufacturer's representative and confirm, prior to preparing submittals, the proposed manufacturer's product meets or exceeds the: material of manufacture; independent testing agency certifications; quality; function; design; and performance of the product specified as the Basis of Design. Final acceptance will be determined by the Engineer, whose decision is final.
- H. Submittals offered as an Equipment Variation from the Basis of Design shall include a letter, on the product manufacturer's letterhead, certifying that the proposed product is a Comparable Product to the product specified as the Basis of Design and conforms to all the salient characteristics, including: material of manufacture; quality; function; design; and performance of the product specified as the Basis of Design. If directed by the Engineer for Products offered as an Equipment Variation, the Offerer shall provide a Letter of Confirmation from a Registered, Professional Engineer attesting that the Proposed Equipment Variation conforms to all the salient characteristics, including: material of manufacture; independent testing agency certifications; quality; function; design; and performance of the product specified as the Basis of Design.
- I. Specific products specified without use of the term: equal; equivalent; comparable product; substitution; or similar term; constitute a proprietary specification, and must be provided as specified, unless a written request is submitted to the Engineer for approval up to ten (10) days after the date of project award. Such requests must include a complete description of the proposed product, along with sufficient documentation and other information necessary for a complete evaluation of the proposed product. Such Trade Contractor Requests shall include a letter, on the product manufacturer's letterhead, certifying that the proposed product is a Comparable Product and conforms to all the salient characteristics, including: material of manufacture; independent testing agency certifications; quality; function, design; and performance of the specified product. If approved, the proposed product will be listed in an addendum to notify all bidders that such acceptance has been granted by the Engineer. If not approved, provide the specified product.
- J. Provide Calculations, signed and sealed by a Professional Engineer registered in the State in which the work is taking place, engaged by the Plumbing Trade Contractor, confirming that the equipment proposed as either a Substitution, or Variation, is a Comparable Product to the product specified as the Basis of Design and conforms to all the salient characteristics, including: material of manufacturer; independent testing agency certifications; quality; function; design; and performance of the product specified as the Basis of Design. Provide such calculations for major pieces of equipment (water heaters, medical gas equipment, fire pumps, etc.). The Engineer, whose decision will be final, will determine which products will require calculations during the submittal review process.
- K. The Contract Documents have been founded upon Engineering Design selection of materials, products, and pieces of equipment listed at the Basis of Design. In the event that the incorporation of an approved Substitution, Variation, or assembly, into the work, requires revisions or additions to the contractual requirements of either the Trade Contractor proposing the substitution or variation, or any other Trade Contractor, the Trade Contractor proposing the substitution or variation, shall bear the cost of: such revisions or additions to the work of the Trade Contractor proposing such Substitution

and/or Variation; any expenses of all affected trades; and all engineering or architectural services required at no change in the contract sum.

- L. The equipment specifications indicated on the drawings, or in Part 2 of each of the technical specifications, may or may not indicate or include all of the required salient characteristics, components and accessories included with the specified product. Include cost for all such characteristics, components and accessories required to meet or exceed the: material of manufacture; independent testing agency certifications; quality; function; design; and performance of the product specified as the Basis of Design.
- M. For requirements regarding equipment variations after bid award, refer to Article "Additional Trade Contractor Paid Fees and Expenses" in Part 3 of this section.
- N. Each Trade Contractor negotiating for pricing advantages affecting the Trade Contractor's Bid shall comply with the directives included herein, bear full responsibility for the accuracy and completeness of the submissions required of the Vendor selected by the Trade Contractor. The Proposing Trade Contractor shall bear full responsibility for all extra costs of the Engineer shown to have resulted from inaccurate, and/or incomplete compliance with the directives included in this Specification Article.
- O. All decisions provided by the Engineer, described herein, shall be final.

2.5 INSERTS, HANGER SUPPORTS, CLAMPS, FASTENINGS

- A. All materials, designs and types of inserts, hanger supports and clamps must meet the requirements of the latest edition of the Manufacturers Standardization Society Document MSS-SP-58, Underwriters Laboratories, Inc., National Electrical Code and Factory Mutual Engineering Division Standards where applicable. Insert, hanger support and clamp types referenced herein are shown in MSS-SP-58.
- B. Provide all necessary inserts, hanger supports, fastenings, clamps and attachments necessary for support of the plumbing work. Select the types of all inserts, hanger supports, fastenings, clamps and attachments to suit both new and existing building construction conditions specifically for the purposes intended.
- C. In new overhead cast-in-place concrete construction, provide type 19 steel concrete inserts and fasten to form work before concrete is cast. For cast concrete floor or roof sections too thin to permit the use of inserts, extend the hanger rod through the slab and terminate with a nut and large washer, recessed into the top face of the slab as approved by the Structural Engineer.
- D. Clamps and attachments to steel beams and bar joists must be made using types 20, 21, 23, 25, 27, 28, 29 or 30 as applicable to suit conditions of construction. Clamps and attachments must be selected on the basis of the required load to be supported. Provide all necessary steel angle iron or channel between bar joists, or steel beams where direct attachment cannot be made. Holes are not permitted to be drilled or burned in structural building steel for hanger rod supports. Welding of hangers or supports to structural steel is prohibited unless approved beforehand by the Structural Engineer.

- E. Metallic masonry anchors may be provided for all pre-cast concrete, masonry and cast concrete construction as an alternate to item (C) above. Locate in pre-cast and cast-in-place concrete as directed by the Structural Engineer. Anchor Basis of Design: Dynabolt, Ram-In and/or Tru-Bolt masonry anchors as manufactured by Ramset. Select and install as recommended by the anchor manufacturer for the various applications, stresses and services involved. Comparable products by Redhead, Hilti or Wej-It may be submitted for review. Installation of masonry anchors must be accomplished by pre-drilling concrete or masonry to diameters and depths required to properly accommodate anchor bolts.
- F. Toggle bolts may be used in dry wall and lath and block plaster walls. The use of toggle bolts is restricted to the weight limitations imposed by the toggle bolt manufacturer for the size used.
- G. Except where noted otherwise herein, attachment to wood or material of similar fibrous nature must be made with lag screws and/or wood screws of required size.
- H. Screws with wooden or plastic plugs, or lead anchors are not acceptable.

2.6 PIPING AND CONDUIT SLEEVES

- A. Provide all sleeves required for plumbing work and be fully responsible for the final and permanent locations thereof.
- B. Provide sleeves in the following locations:
 - 1. All pipes and conduits passing through all cast-in-place concrete construction and masonry walls.
 - 2. All pipes and conduits passing through cast-in-place waterproof concrete construction and waterproof masonry walls.
- C. Extend through construction and finish flush with each surface except where noted otherwise. Provide for a minimum 1/2" clearance around conduit, pipe or its covering in the instance of pipe covered with insulation.
- D. All sleeves in waterproof walls and floors must be fitted and sealed with positive hydrostatic mechanical seals. Provide Basis of Design Product "Link Seal" as manufactured by Thunderline Corporation or Comparable Product by Advance Products and Systems, Inc. or Proco Products, Inc. Sleeves must be sized accordingly. Mechanical seals must be placed around piping and/or conduit and inserted into void between inner wall of sleeve and piping and/or conduit. Tighten mechanical seals as required for watertight seal.
- E. All sleeves must be Schedule 40 steel pipe finished with smooth edges. Sleeves in waterproof walls and floors must be fabricated with minimum 1/4" thick rectangular steel plate placed around mid-point of sleeve, continuously welded to sleeve and then place the entire/plate assembly into proper position prior to erection of walls and floors. Otherwise, provide sleeves with a minimum of three (3) lugs for anchoring.
- F. Pack voids between sleeves, piping or conduit, where located in fire or smoke rated assemblies, in accordance with UL Fire Resistance Directory.

- G. Set all sleeves prior to or during erection of walls and floors. In the event that sleeves are omitted or incorrectly located in new walls or slabs, submit a location plan and method of cutting and installing sleeves to the Engineer for review prior to carrying out the work.
- H. If sleeves are omitted or located incorrectly, the particular Trade Contractor who is at fault, at no additional cost to the project, must engage the trade which originally installed the work, to cut and patch to the satisfaction of the Engineer.
- I. Provide mechanical seals and insert into voids between piping and conduits that pass through floors, and which will be exposed in finished areas that have floor drains, including spaces classified as "Janitors Closets," "Toilet Rooms," and the like.
- J. Where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine, such as a masonry saw or core drill, to insure a neat hole.

PART 3 - EXECUTION

3.1 METHOD OF PROCEDURE

- A. The drawings accompanying these specifications are diagrammatic and intended to cover the approximate and relative locations of the building systems.
- B. Installation, connection and interconnection of all components of these systems must be complete and made in accordance with the manufacturers' instructions and best trade practices.
- C. Erect all parts of equipment furnished at such time and in such manner as not to delay or interfere with other Trade Contractors and their work.
- D. Plug all piping, conduit and ductwork as required during construction to prevent entering of dirt.
- E. Before material is ordered or fabricated, or any work is performed, verify all calculations, sizing, measurements, including lines, grades, pipes and conduit elevations at the building, as applicable, and be responsible for the correctness thereof. No extra compensation will be allowed on account of differences between actual dimensions, routing and measurements and those indicated in the Contract Documents. Any discrepancies discovered must be submitted to the Engineer for consideration before proceeding with the work.
- F. Lay out work and be responsible for the establishment of heights, grades, and the like, for all interior and exterior equipment and systems as applicable, including piping, drains, fixtures, conduit, and the like, included in Contract Documents, in strict accordance with the intent expressed thereby; and all the physical conditions to be met at the building and finished grade, and be responsible for accuracy thereof. The establishment of the location of all work must be performed in consideration of the finished work. In case of conflict, equipment and/or materials must be relocated without cost to the Project, as directed by

the Engineer, regardless of which equipment was installed first. Refer to Article, "Coordination Drawings", in Part 1 of this section.

- G. Cooperate with other Trade Contractors for the proper securing and anchoring of all work included within these specifications. Use extraordinary care in the erection and installation of all equipment and materials to avoid marring surfaces of the work of other Trade Contractors, as each Trade Contractor will be held financially responsible for all such injury caused by the lack of precaution and due to negligence on the part of the Trade Contractor's work force.
- H. Do not run pipe or conduit in any concrete slab three inches (3") or less in thickness. Do not place any pipe or conduit in any slab where the outside diameter of the pipe or conduit is more than one-quarter the thickness of the slab. The sweep of pipe or conduit elbows emerging through concrete slabs must not create any hazard or obstructions.
- I. All piping, conduit and other materials and equipment shown to be mounted below ceilings are to be kept as close to ceiling areas as possible unless otherwise noted.
- J. Install and arrange all equipment, such as valves, air vents, cleanouts, traps and the like, which will be concealed in construction, to be fully accessible for adjustment, service and maintenance. Furnish access doors where required for installation under the General Construction Contract, where applicable. Otherwise, furnish and install all required access doors.

3.2 PROTECTION OF WORK

- A. Provide all piping, equipment, materials and accessories having polished or plated surfaces, machined finishes or unpainted surfaces with a thick coat of a neutral protection grease and carefully cover with thick cloth or heavy building paper held securely in place to protect the finish against damage during the entire period of construction. Protect equipment by the use of canvas tarps, vinyl sheeting or similar materials held securely in place.
- B. Seal all openings in pipes, fittings, conduit and all other materials to exclude dirt, sand, and other foreign materials.
- C. Exercise every precaution to exclude dust, dirt and all other foreign materials from switchgear rooms, transformers, and all mechanical equipment rooms during construction. Rooms and equipment contained therein must be swept and vacuum cleaned at regular intervals. All relays, meters and plumbing equipment containing electrical components must be protected with heavy paper held in place with approved mastic tape to exclude fine dust and particles. Install and maintain sufficient electric heaters in equipment rooms and transformer compartments to keep equipment dry during construction.

3.3 CUTTING AND PATCHING

- A. New Construction:
 - 1. Perform cutting and patching in accordance with Division 01.

2. Provide and set all sleeves, inserts and other items required for the installation of the Plumbing work, and take responsibility for their final and permanent locations.
 3. Confer with, and give the General Construction Trade Contractor, where applicable, complete information as to size of openings in all construction, so that such openings may be provided as the building progresses. Otherwise, provide openings as required for the plumbing work.
 4. If openings are omitted or incorrect through failure to follow these instructions the particular Trade Contractor must, at no additional cost to the project, engage the trade which originally installed the work to cut and patch to the satisfaction of the Engineer.
- B. For existing construction:
1. The General Construction Trade Contractor, where applicable, will perform all cutting and patching required for the work of all trades. Otherwise, all Trade Contractors are responsible for their own cutting and patching.

3.4 CONCRETE AND MASONRY

- A. Provide all cast-in-place concrete, pre-cast concrete and masonry work (brick and block) required for completion of the plumbing work, including interior and exterior concrete slabs.
- B. Engineer will review and approve materials used.
- C. Unless shown or specified otherwise, all equipment foundations and housekeeping pads must be six inches (6") minimum height from floor, of sufficient mass, and secured to the floor.
- D. Refer to Division 03 for concrete specifications.
- E. Unless noted otherwise, concrete bases must be 4" larger than the largest dimension of the base of the supported equipment in both directions. Use 3000 psi, 28 day compressive strength concrete and reinforcement.

3.5 SUPPORTS

- A. Except where noted otherwise in the specifications and shown on drawings, provide all materials, including, but not limited to, equipment supports, supplies and labor necessary as required to adequately support, brace and strengthen new and/or existing equipment and materials installed under/or affected by the plumbing work.
- B. The design, materials, fabrication and erection of structural steel supports must conform to "Specification for Design, Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction, "Code of Standard Practice for Steel Buildings and Bridges". Welding, where required, must conform to "Code of Arc and Gas Welding in Building Construction" of the American Welding Society.

3.6 ESCUTCHEONS

- A. Except as noted otherwise, provide heavy solid pattern, steel, cast iron or malleable iron escutcheons with set screws and prime coat of paint on all uninsulated piping and conduit exposed to view within structure where passing through floors, partitions, walls or ceilings. Escutcheons are not required in equipment rooms, boiler rooms or other unfinished areas.
- B. For piping with sleeves extending above floor, provide escutcheons with deep recesses.
- C. Provide solid pattern, smooth chrome plated cast brass escutcheons for all chrome plated pipe fixture connections.
- D. Provide nickel plated cast iron escutcheons where pipes pass through toilet rooms, walls or ceilings.

3.7 PAINTING AND FINISHING

- A. All painting, generally, will be provided by the General Construction Trade Contractor, where applicable, except where specifically noted otherwise in the Plumbing Specifications. Otherwise, all Trade Contractors are responsible for their own painting and finishing.
- B. Equipment and material furnished with factory enamel finish will not be painted unless finish has been damaged, in which case the equipment or material must be refinished by the Trade Contractor who furnished it, to the satisfaction of the Engineer.

3.8 PIPING AND CONDUIT UNDER FLOORS

- A. Wherever piping, conduit or piping enclosures are run under a floor slab on grade, the work is to be installed after the General Construction Trade Contractor, where applicable, has brought the sub-grade to the proper level.
- B. Excavate and backfill as required for the installation of plumbing work. The excavation of the sub-grade where required for the installation of the work must be performed, including that for piping, conduit and piping enclosures, by the Plumbing Trade Contractor. When the installation is completed and satisfactorily tested, the remaining space shall be filled with crushed stone or other material similar to that to be used by the General Construction Trade Contractor, where applicable, for the sub-base. The backfill must be stabilized by hand or pneumatic tamping as directed by the Engineer and must be returned to the original sub-grade level.
- C. No piping, conduit or piping enclosures is to be installed in the stone sub-base which is part of the General Construction Trade Contractor's work, where applicable, unless specific permission is granted by the Engineer.
- D. Where piping is noted to be installed in enclosures, such as split terra cotta pipe, necessary protection of the insulation, arrangement and installation will be as hereinafter described in the detailed technical specifications.

- E. Where required by drawing notes, specifications, or applicable electrical codes, conduits installed under floors must be encased in concrete, conforming to the Division 03 specifications.

3.9 ABANDONMENT, REMOVAL AND RELOCATION

- A. Removals shown on drawings are a general indication only, and may not necessarily indicate the full extent of removals which may be required to complete this work.
- B. Where existing partitions, walls, ceilings and floors are to be removed, all piping, conduits, materials, fixtures and equipment attached or fastened thereto or within, as applicable, must be carefully removed.
- C. Where work under this contract interferes with the existing construction, ductwork, piping, conduit or equipment, remove all such materials and route new work to clear the obstruction. Provide additional piping, conduits and material of the same design and quality if the piping and/or conduit is to be continued in use.
- D. Disconnect and remove all accessible piping, conduit, ductwork, materials, fixtures and equipment not required in the new systems. Plug all outlets at the main or riser connection.
- E. Removed materials not desired by the Owner and not to be reset and not specified nor indicated to be reused, become the property of the Plumbing Trade Contractor and must be promptly removed from site.
- F. All demolition work is subject to the direction and approval of the Engineer and must be performed in such manner as not to interfere with the normal operation of the building.
- G. Relocate existing utilities and/or equipment that must remain to maintain operation of building or parts of building outside the work area.

3.10 SUBSURFACE CONCEALED UNKNOWN PHYSICAL CONDITIONS

- A. Subsurface, or otherwise concealed physical conditions which (1) do not differ materially from those indicated in the Project Contract Documents; (2) affect plumbing and electrical work; (3) do not differ materially from those ordinarily found to exist, and which are generally recognized as inherent in the mechanical and electrical construction activities of the character provided for in the Project Contract Documents, are to be anticipated by the Plumbing Trade Contractor, and included in the basic plumbing work.
- B. Unknown physical conditions: which are of an unusual nature; which are materially different in subsurface (otherwise concealed) physical conditions; which affect plumbing and/or electrical work; which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character found in the Project Contract Documents, are the basis for, and require notice by, the applicable Trade Contractor, promptly, before such conditions are disturbed. Such conditions may become the basis for a legitimate claim under "Changed Conditions," affecting the cost, and/or schedule of the work. During the work, the Plumbing Trade Contractor shall provide

reasonable, incidental on-site review, survey and measurements to assist in quantification of such conditions.

3.11 CONCRETE PATCHING (PROCEDURE)

- A. Remove any loose debris, chipped or cracked portions of concrete, and any grease, oil, dirt or other coating materials from the concrete to be patched.
- B. Apply epoxy bonding adhesive to the clean dry surface with a brush or roller to briefly flood the surface allowing good penetration, if completely absorbed, apply additional material. Adhesive Basis of Design: Edison Coatings Inc. Flexi-Bond 540. Comparable product by Sika Corp. or Euclid Chemical Co. may be submitted for review. Refer to Division 03 of these specifications.
- C. Apply new cementitious mortar patch to surface immediately after applying bonding adhesive, bonding agent should be wet while applying concrete patch. Mortar patch equal to Moxie International 2000 Super Patch. Comparable product by Sika Corp. or Euclid Chemical Co. may be submitted for review. Refer to Division 03 of these specifications.
- D. Work patch into any cracks or crevices with a brush, then apply remainder of patch and trowel until level and smooth.
- E. Do not apply patch below 45 deg. F.

3.12 TEMPORARY PARTITIONS

- A. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas. Refer to Division 01 of these specifications.

3.13 INITIAL APPLICATION FOR PAYMENT

- A. Provide the following prior to submitting the initial application for payment:
 - 1. Copy of Plumbing Trade Contractor's and Sub-Contractors' licenses for the state in which the work is being performed.
 - 2. Resumes for the designated Project Manager and Project Foreman.
 - 3. List of independent agencies who will be engaged by the Plumbing Trade Contractor to perform tests, provide certifications, conduct inspections, etc. as required by Contract Documents.
- B. The initial application for payment will not be processed until the items above are submitted.
- C. Provide line items for:
 - 1. Coordination Drawings.
 - 2. Plumbing Testing, Adjusting and Balancing Report.

3.14 FINAL APPLICATION FOR PAYMENT

- A. Provide the following prior to submitting the final application for payment:
1. Refer to Division 01 of these specifications.
 2. Pipe Pressure Test Reports.
 3. Equipment Start-Up Reports for each piece of plumbing equipment.
 4. Operation and Maintenance Manuals and Data.
 5. Testing, Adjusting and Balancing Report for plumbing systems.
 6. Plumbing system and equipment warranties.
 7. Plumbing Contractor Closeout Checklist indicating dates of submitted requirements.
 8. Plumbing Contractor's Punch List of incomplete work items with reason why each work item is not complete and anticipated schedule for completion. Submit at least one week prior to Engineer's final Construction Observation Report site visit.
 9. Signed and dated Engineer's final construction observations report.
 10. Plumbing Trade Contractor's notarized certification letter.
 11. As-built drawings as described in Part 1 of this specification section.
- B. Final payment is contingent upon completion of all items listed above.

3.15 INDEMNIFICATION

- A. The drawings and specifications covering the work of Divisions 22 and 26, as applicable, shall not be interpreted by the Plumbing Trade Contractor as quantification, and/or classification of the construction methods, and/or construction means required to carry out the required construction. There is no explicit or implicit representation that any portion of this work can be installed and/or constructed through any particular normal, reasonable, abnormal, or unusual means and methods. By submission of a pricing bid for this work, the Plumbing Trade Contractor shall accept sole and individual responsibility for the determination and execution of the methods and means selected to complete this work.
- B. The Plumbing Trade Contractor, to the fullest extent permitted by law, agrees to indemnify, hold harmless, and defend Gillan & Hartmann, Inc., its consultants, and the employees and agents of any of them from and against any and all claims, suits, demands, liabilities, losses, damages, and costs ("Losses"), including but not limited to costs of reasonable defense, arising in whole or in part out of the negligence of the Plumbing Trade Contractor, its Sub-Contractors, the officers, employees, agents, and Sub-Contractors of any of them, or anyone for whose acts any of them may be liable, regardless of whether or not such Losses are caused in part by a party indemnified hereunder. Specifically excluded from the foregoing are Losses arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs, or specifications, and (2) the giving of or failure to give directions by Gillan & Hartmann, Inc., its consultants, and the agents and employees of any of them, provided such giving or failure to give is the primary cause of Loss.
- C. The Plumbing Trade Contractor shall name Gillan & Hartmann, Inc., its agents and consultants on the Plumbing Trade Contractor's policy or policies of comprehensive or commercial general liability insurance. Such insurance shall include products and

completed operations and contractual liability coverages, shall be primary and noncontributing with any insurance maintained by Gillan & Hartmann, Inc. or its agents and consultants, and shall provide that Gillan & Hartmann, Inc. be given thirty days, unqualified written notice prior to any cancellation thereof.

3.16 ADDITIONAL PLUMBING TRADE CONTRACTOR PAID FEES AND EXPENSES

- A. As a material part of Plumbing Trade Contractor's Agreement to complete the work of this Contract, the Plumbing Trade Contractor agrees to reimburse Gillan & Hartmann, Inc. ("Engineer") for the below listed extra engineering work under the following conditions:
1. Engineer's hourly billing rate shall be \$250.00 per hour for all related office hours, travel time and as applicable, on-site time;
 2. Contractor's request(s) for substitution;
 - a. When such requests for substitution are not the result of a bonafide delivery problem or design related problem, and;
 - b. When such requests do not address items of equipment for which the specifications list the basis of design with at least one comparable product, and;
 - c. The Plumbing Trade Contractor's request(s) for substitution must be submitted in writing, and;
 - d. The Engineer will provide the Plumbing Trade Contractor with a written budget, not to exceed quotation for the Engineer's billing, and;
 - e. The Plumbing Trade Contractor shall render written acceptance of the Engineer's extra charges, and;
 - f. The Plumbing Trade Contractor shall pay a retainer, in advance, equal to 80% of the established budget for the Engineer's extra work.
 - g. The balance of the Engineer's charges beyond the retainage shall be paid upon completion of the Engineers' extra work in reviewing the substitution(s). Final payment is due regardless of the Engineer's decision to accept or reject the Plumbing Trade Contractor's substitution request(s), and;
 - h. Late payments shall incur an interest rate of 1½% per month compounded from due date to date of collection, and;
 - i. The Plumbing Trade Contractor's balance due for his/her beneficial contracted work, unpaid beyond 60 days of due date, will be deducted from progress payments due the Plumbing Trade Contractor, and will include all additional administrative costs incurred by the Owner, in affecting such deductions.
 3. Extra Engineering work created by the Plumbing Trade Contractor's failure to resolve the Engineer's Items listed in the Construction Observation Report(s);
 - a. The Engineer's basic services rendered to the Owner include periodic visits to the site and providing written list of items (Construction Observation Report) requiring the Plumbing Trade Contractor's attention, reporting and resolution;
 - b. The Plumbing Trade Contractor shall provide written feedback and prompt resolution of Construction Observation Items including a written schedule for the Plumbing Trade Contractor's completion of these Items followed by a written confirmation of closure;

- c. Should the Plumbing Trade Contractor fail to perform as described above, and should such failure require, in the opinion of the Owner and the Engineer, that the Engineer must expend extra work in bringing closure and resolving the Plumbing Trade Contractor's open Items, the Plumbing Trade Contractor agrees pay the Engineer for all extra work required. The Engineer will provide a written notice of the not to exceed budget for the Engineer's extra work in advance as a prudent notification that the extra work will be initiated. Subsequent failure of the Plumbing Trade Contractor to resolve these outstanding issues will result in the Engineer's completion of the extra work, and billing the Plumbing Trade Contractor accordingly. The Engineer's payment for this additional work shall be deducted from the Plumbing Trade Contractor's final payment for the work under this Contract. Deductions from the Final Payment will be made to cover all the Owner's additional costs in affecting such deductions.
4. The Plumbing Trade Contractor's request for substitution of specified equipment when such specifications list a basis of design and at least one comparable product such requests will be rejected.
5. Extra Engineering work created by the Plumbing Trade Contractor's multiple submissions of a single material or piece of equipment;
 - a. The Engineer's basic services include two reviews for each piece of equipment or material submittal. The Engineer's first review takes place at the initial Plumbing Trade Contractor's submission of that submittal. The Engineer's second review takes place when the Engineer requires a resubmission of that submittal.
 - b. If the Engineer's third review of a particular submittal is required for reasons due to the Plumbing Trade Contractor, the Engineer will provide the Plumbing Trade Contractor with a written budget, not to exceed quotation for the Engineer's extra work in reviewing the submittal.
 - c. The Plumbing Trade Contractor shall render written acceptance of the Engineer's extra charges.
 - d. The Plumbing Trade Contractor shall pay a retainer, in advance, equal to 80% of the established budget for the Engineer's extra work.
 - e. The balance of the Engineer's charges beyond the retainage shall be paid upon completion of the Engineers' extra work in reviewing the submittal.
 - f. Late payments shall incur an interest rate of 1½% per month compounded from due date to date of collection.
 - g. The Plumbing Trade Contractor's balance, unpaid beyond 60 days of due date, will be deducted from progress payments due the Plumbing Trade Contractor for work under this Contract and will include additional administrative costs incurred by the Owner in affecting all such deductions.

3.17 FORMS

Date: 5/25/2016

GILLAM HARTMANN, INC. REQUEST FOR PROFESSIONAL'S REVIEW/COMMENT
 140 Whitaker Avenue, Mont Clare, PA 19453 PROPOSED MANUFACTURERS SUB-CONTRACTORS LIST

Project No.: _____
 Contract No.: _____
 Project Title: _____
 Location: _____
 Contractor's Authorized Staff Signature: _____
 Print Name: _____

1.) LIST OF ABBREVIATORS (ABB): **MFR:** MANUFACTURER **SUB:** SUBCONTRACTOR **SUBST:** SUBSTITUTION
TEST: TESTING AGENCY **WELD:** WELDER **CERT:** CERTIFICATION
FAB: FABRICATOR **SUP:** SUPPLIER

- 2.) SIGNIFY BY **X**, IF PRODUCT IS BASIS OF DESIGN, AS DEFINED IN THE CONTRACT DOCUMENTS;
- 3.) SIGNIFY BY **X**, IF PRODUCT A LISTED MANUFACTURER (VARIATION), AS DEFINED IN THE CONTRACT DOCUMENTS; LIST MANUFACTURER
- 4.) SIGNIFY BY **X**, IF PRODUCT IS A COMPARABLE PRODUCT; I.E. NON-LISTED IN THE CONTRACT DOCUMENTS (SUBSTITUTION), AS DEFINED IN THE CONTRACT DOCUMENTS; CERTIFICATION OF COMPARABLE PRODUCT FROM MANUFACTURER MUST BE ATTACHED. INCLUDE ASSOCIATED DOCUMENTATION REQUIRED BY THE CONTRACT DOCUMENTS.
- 5.) SIGNIFY BY **Y** OR **N**, IF PROPOSED SUBCONTRACTOR IS AN INDEPENDENT AGENT WITH NO CONFLICT OF INTEREST WITH CONTRACTOR.

CONTRACTOR NAME AND ADDRESS:				ADDITIONAL SUBMITTAL INFORMATION REQUESTED BY PROFESSIONAL, BASED ON INITIAL SUBMISSIONS								
Material or Work, indicate associated Specifications Section/Para.	ABB (1)	Basis of Design (2)	Listed Manufacturer/ Variation (3)	Comparable Product/ Substitution (4)	Name & Address	Relation to Contractor Y or N (5)	FOR PROF. USE ONLY					
							Sample	Shop Data	Subst. Info	None Requested	Proceed Submittal	REJ
EXAMPLE: Hydraulic Piping - Section 1510.2.2	SUP	X			1/2 PIPING, 224 NASH ST, SMALLTOWN, US-19383	N						

REVIEWED: _____
 SIGNATURE OF PROFESSIONAL _____
 Page 1 of 4

Gillan Hartmann, Inc.
PLUMBING SHOP DRAWING LOG

PROJECT NAME: _____ JOB NO.: _____ DATE: 5/25/2016

ITEM NO.	PROPOSED SUBMITTAL DATE	DATE REC'D	MFR. OR CONTRACTOR	DESCRIPTION	Action	Date Return	Re-submit	Distrib.	Sent to Elec.	Checked by
P-01										
P-02										
P-03										
P-04										
P-05										
P-06										
P-07										
P-08										
P-09										
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P-19										
P-20										
P-21										
P-22										

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 Status: Pending (P); Furnish as Submitted (FAS) Furnish As Noted (FAN); Rejected (REJ); No Submission Required (NSR)

**PLUMBING CONTRACTOR'S TRANSMITTAL COVER
SHEET**

TO: GILLAN & HARTMANN, INC.
CONSULTING ENGINEERS
P.O. BOX 345
VALLEY FORGE, PENNSYLVANIA 19481

Date of Transmittal: _____	By Contractor: _____ Contractor's Authorized Staff Signatures: _____ Print Name: _____ Project: _____
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By executing this Transmittal Cover, Contractor agrees and accepts that:

- Shop drawings submitted without the Contractor's signed stamp of approval will not be reviewed. Initialed approval stamps are not acceptable. All resulting resubmittals will be provided at the Contractor's expense;
- The Engineer's recommendation of acceptance ("Furnish as Submitted", "Furnish as Noted Below", etc.) of the equipment proposed by the Contractor is conditional upon the Contractor fulfilling all obligations of the Contract Documents. By furnishing the proposed equipment, the Contractor acknowledges compliance with all of the following:

The Contractor has completed field layout and planning of proposed equipment and has coordinated all other related shop drawings, related trades involved in Project Construction, and all space requirements;

The Contractor has examined all shop drawings prior to submission. The Contractor forwards all shop drawings with a signed approved stamp, signifying the following: 1) all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data have been verified; 2) the Architect/Engineer have been notified of all site conditions which affect the work, and which require design resolution beyond resolution by Trade Contractors' Field Decisions; 3) all items herein are approved by the Contractor, and have been coordinated and checked with other applicable shop drawings, and contract requirements; 4) submission is clearly marked to indicate which manufacturer's options are provided and which are not provided with the proposed equipment;

Any and all exceptions requested by the Contractor have been included in written form. All exceptions, deletions and additions that vary from the Contract Documents have been specifically annotated and initialed. Failing to provide initialed annotations for all deletions and additions, the Contractor accepts the condition that the Contract Documents will govern, and will be used to resolve disputes;

All Engineer's notes regarding this submission must be incorporated into the Project;

The Engineer's review is limited to comparison of the technical performance of the Contractor's proposed equipment to the specified technical performance;

Equipment submittal is either the Basis-of-Design, or a comparable product to the Basis-of-Design;

A Comparable Product must meet or exceed all the salient characteristics and standards necessary including, but not limited to: material of manufacture; independent testing agency certifications; quality; function; design; and performance required to meet the Owner's needs and meet the objectives of the Professional's Project Design;

Extension of Contract Time and/or claim for delay are not acceptable as created by the Trade Contractor's failure to provide submittals on a timely basis to permit the processing work of the Professional, including multiple resubmittals, and/or failure to provide submittals that are comparable to the Basis of Design Product. Refer to EQUIPMENT VARIATIONS AND SUBSTITUTIONS article in the General Requirements Section of the Specifications.

G&H Project No: _____

G&H Shop Drawing Review No: P-_____

Contractor's Submittal Description: _____, Project _____
(Fill In) (Fill In)

**PLUMBING AND ELECTRICAL TRADES'
COORDINATION OF PLUMBING EQUIPMENT
ELECTRICAL REQUIREMENTS
TRANSMITTAL COVER SHEET**

TO: GILLAN & HARTMANN, INC.
CONSULTING ENGINEERS
P.O. BOX 345
VALLEY FORGE, PENNSYLVANIA 19481

By Plumbing Trade Rep: _____
Contractor's Authorized Staff Signature: _____
Print Name: _____
Date of Transmittal: _____

By Electrical Trade Rep: _____
Contractor's Authorized Staff Signature: _____
Print Name: _____
Date of Transmittal: _____

By executing this Transmittal Cover, the Contractor agrees and accepts that:

1. Submittals without the Plumbing and Electrical Trades' signed stamp of approval will not be reviewed. Initialed approval stamps are not acceptable. All resulting resubmittals will be provided at the Contractor's expense.
2. The Plumbing Trade Representative has submitted the attached Plumbing Equipment Submittal to the Electrical Trade Representative for examination, review, and coordination of the attached Plumbing Equipment Electrical Requirements. The equipment proposed by the Contractor is conditional upon the Contractor fulfilling all obligations of the Contract Documents. By furnishing the proposed equipment, the Contractor acknowledges compliance with all of the following:
 - A. The Contractor has completed field layout and planning of proposed equipment and has coordinated all other related submittals, related Trades involved in Project Construction, and all space requirements.
 - B. The Plumbing and Electrical Trades have examined all submittals prior to submission. The Plumbing and Electrical Trades forwards all submittals with a signed transmittal stamp, signifying the following:
 - 1) All field measurements, field construction criteria, electrical power requirements and similar data have been verified;
 - 2) The Architect/Engineer has been notified of all site conditions which affect the work, and which require design resolution beyond resolution by Trade contractors' Field Decisions;
 - 3) All items herein are approved by the Contractor, and have been coordinated and checked with other applicable submittals, and contract requirements;
 - 4) Submission is clearly marked to indicate which manufacturer's options are provided and which are not provided with the proposed equipment.
 - C. Any and all exceptions requested by the Plumbing and Electrical Trades have been included in written form. All exceptions, deletions, and additions that vary from the Contract Documents have been specifically annotated and initialed. Failing to provide the initialed annotations for all deletions and additions, the Contractor accepts the condition that the Contract Documents will govern, and will be used to resolve disputes.

G&H Project No: _____

G&H Shop Drawing Review No: _____

END OF SECTION 220010

SECTION 220513 – COMMON MOTOR REQUIREMENTS FOR PLUMBING 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 alternating-current power systems up to 600 V 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 NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

- A. 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: Premium efficient, as defined in NEMA MG 1.

- C. Multispeed Motors: Separate winding for each speed.
- D. Rotor: Random-wound, squirrel cage.
- E. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- F. Temperature Rise: Match insulation rating.

2.4 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 220513

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves without waterstop.
 - 2. Sleeves with waterstop.
 - 3. Stack-sleeves.
 - 4. Sleeve-seal systems.
 - 5. Grout.
 - 6. Silicone sealants.

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 SLEEVES WITHOUT WATER-STOP

- A. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends.
- B. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.
- C. Steel Sheet Sleeves: ASTM A653/A653M; hot-dip galvanized, round tube closed with welded longitudinal joint.

2.2 SLEEVES WITH WATER-STOP

- A. Manufactured sleeve-type, water-stop assembly made for imbedding in concrete slab or wall.

2.3 STACK-SLEEVE

- A. Manufactured, Dura-coated, Duco-coated or galvanized cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.

2.4 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Designed to form a hydrostatic seal of 20 psig minimum.
 - 2. Sealing Elements: EPDM-rubber or Nitrile 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.
 - 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.5 GROUT

- A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000 psi , 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.6 SILICONE SEALANTS

- A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES - GENERAL

- 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.
 - 1. Sleeves are not required for Core Drilled holes.

- C. Install sleeves in floors and walls.
 - 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.
 - 2. Using grout or silicone sealant, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.
- E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials.

3.2 INSTALLATION OF SLEEVES WITH WATERSTOP

- A. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls.
- B. Secure nailing flanges to concrete.
- C. Using grout, seal the space around outside of sleeves.

3.3 INSTALLATION OF SLEEVE-SEAL SYSTEMS

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at piping entries into building, and passing through exterior walls.
- 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 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

2. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.
- B. Prepare test and inspection reports.

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 DEFINITIONS

- A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed and salvaged, or removed and reinstalled.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. BrassCraft Manufacturing Co.; a Masco company.
 - 2. Dearborn Brass.
 - 3. Jones Stephens Corp.
 - 4. Keeney Manufacturing Company (The).
 - 5. Mid-America Fittings, LLC; A Midland Industries Company.

2.2 ESCUTCHEONS

- A. One-Piece, Steel Type: With polished, chrome-plated or polished brass finish and setscrew fastener.
- B. One-Piece, Stainless-Steel Type: With polished stainless-steel finish.

- C. One-Piece, Cast-Brass Type: With polished, chrome-plated or polished brass finish and setscrew fastener.
- D. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel or brass with polished, chrome-plated finish and spring-clip fasteners.
- E. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.
- F. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed and exposed-rivet hinge; and spring-clip fasteners.

2.3 FLOOR PLATES

- A. Split 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 insulated piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
 - b. Chrome-Plated Piping: split-casting brass with polished, chrome-plated finish.
 - c. Insulated Piping: chrome-plated polished brass finish.
 - d. Insulated Piping: One-piece stainless steel with polished stainless-steel finish.
 - e. Insulated Piping: One-piece cast brass with polished, chrome-plated brass finish.
 - f. Insulated Piping: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
 - g. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated brass finish.
 - h. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stainless steel with polished stainless-steel finish.
 - i. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated brass finish.
 - j. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with chrome-plated finish.
 - k. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated brass finish.
 - l. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece stainless steel with polished stainless-steel finish.

- m. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
 - n. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
 - o. Bare Piping in Unfinished Service Spaces: One-piece steel with polished, chrome-plated finish.
 - p. Bare Piping in Unfinished Service Spaces: One-piece cast brass with polished, chrome-plated finish.
 - q. Bare Piping in Unfinished Service Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
 - r. Bare Piping in Equipment Rooms: One-piece steel with polished, chrome-plated finish.
 - s. Bare Piping in Equipment Rooms: One-piece cast brass with polished, chrome-plated finish.
 - t. Bare Piping in Equipment Rooms: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
2. Escutcheons for Existing Piping to Remain:
- a. Chrome-Plated Piping: Split-casting, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.
 - d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.
 - e. Bare Piping in Unfinished Service Spaces: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.
 - f. Bare Piping in Equipment Rooms: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. 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.
 - 2. Existing Piping: Split floor plate.

3.2 FIELD QUALITY CONTROL

- A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 220518

SECTION 220523.12 - BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Brass ball valves
 - 2. Bronze ball valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. Press-end connection: Valves suitable for connection to a pressure-sealed system.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, and soldered ends.
 - 3. Set ball valves open to minimize exposure of functional surfaces.
- 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 operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 3. ASME B16.18 for solder-joint connections.
 - 4. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Handlever: For quarter-turn valves smaller than NPS 4.
- H. Valves in Insulated Piping:
 - 1. Include 2-inch stem extensions.
 - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
 - 3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRASS BALL VALVES

- A. Brass Ball Valves, Two Piece with Full Port and Brass Trim, Threaded or Soldered Ends:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO INC.; or a comparable product by one of the following:
 - a. Apollo Flow Controls; Conbraco Industries, Inc.
 - b. Milwaukee Valve Company.
 - c. WATTS.
 - 2. Standard: MSS SP-110; MSS SP-145.

3. CWP Rating: 600 psig.
4. Body Design: Two piece.
5. Body Material: Forged brass.
6. Ends: Threaded or soldered.
7. Seats: PTFE.
8. Stem: Brass.
9. Ball: Chrome-plated brass.
10. Port: Full.

B. Brass Ball Valves, Two Piece with Full Port and Brass Trim, Press Ends:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO INC.; or a comparable product by one of the following:
 - a. Apollo Flow Controls; Conbraco Industries, Inc.
 - b. Milwaukee Valve Company.
 - c. WATTS.
2. Standard: MSS SP-110; MSS SP-145; IAPMO/ANSI Z1157.
3. CWP Rating: Minimum 200 psig.
4. Body Design: Two piece.
5. Body Material: Forged brass.
6. Ends: Press.
7. Press-End Connections Rating: Minimum 200 psig.
8. Seats: PTFE or RPTFE.
9. Stem: Brass.
10. Ball: Chrome-plated brass.
11. Port: Full.
12. O-Ring Seal: Buna-N or EPDM.

2.3 BRONZE BALL VALVES

A. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim, Threaded or Soldered Ends:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO INC.; or a comparable product by one of the following:
 - a. Apollo Flow Controls; Conbraco Industries, Inc.
 - b. Milwaukee Valve Company.
 - c. WATTS.
2. Description:
 - a. Standard: MSS SP-110 or MSS-145.
 - b. CWP Rating: 600 psig.
 - c. Body Design: Two piece.
 - d. Body Material: Bronze.
 - e. Ends: Threaded and soldered.

- f. Seats: PTFE.
 - g. Stem: Bronze or brass.
 - h. Ball: Chrome-plated brass.
 - i. Port: Full.
- B. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim, Press Ends:
1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO INC.; or a comparable product by one of the following:
 - a. Apollo Flow Controls; Conbraco Industries, Inc.
 - b. Milwaukee Valve Company.
 - c. WATTS.
 2. Description:
 - a. Standard: MSS SP-110 or MSS-145.
 - b. CWP Rating: Minimum 200 psig.
 - c. Body Design: Two piece.
 - d. Body Material: Bronze.
 - e. Ends: Press.
 - f. Press Ends Connections Rating: Minimum 200 psig.
 - g. Seats: PTFE or RTPFE.
 - h. Stem: Bronze or brass.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.
 - k. O-Ring Seal: EPDM or Buna-N.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in applicable Division 22 Sections for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 4 and Smaller: Threaded ends except where solder-joint valve-end option or press-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 5 and Larger: Flanged ends.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 4 and Smaller:
 - 1. Bronze ball valves, two-piece with full port and bronze or brass trim. Provide with threaded, solder, or press connection-joint ends.

END OF SECTION 220523.12

SECTION 220523.14 CHECK VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bronze, lift check valves.

1.2 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene-diene terpolymer.
- C. NBR: Nitrile butadiene rubber (also known as Buna-N).

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of valve.

1.4 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, press connections, and weld ends.
 - 3. Set 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 stems or other components as lifting or rigging points unless specifically indicated for this purpose in manufacturer's instructions.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of valve from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Standards:

1. Domestic water piping check valves intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), requirements of authorities having jurisdiction, and NSF 61/NSF 372, or to be certified in compliance with NSF 61/NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges for metric standard piping.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for cast-copper solder joint.
6. ASME B16.22 for wrought copper solder joint.
7. ASME B16.51 for press joint.
8. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for groove-end connections.

D. Provide bronze valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are unacceptable.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.3 BRONZE, LIFT CHECK VALVES

A. Bronze, Lift Check Valves with Bronze Disc, Class 125:

1. Description:

- a. Standard: MSS SP-80, Type 1.
- b. CWP Rating: 200 psig.
- c. Body Design: Vertical flow.
- d. Body Material: ASTM B61 or ASTM B62, bronze.
- e. Ends: Threaded or soldered. See valve schedule articles.
- f. Disc: Bronze.

B. Bronze, Lift Check Valves with Nonmetallic Disc, Class 125:

1. Description:

- a. Standard: MSS SP-80, Type 2.
- b. CWP Rating: 200 psig.
- c. Body Design: Vertical flow.
- d. Body Material: ASTM B61 or ASTM B62, bronze.
- e. Ends: Threaded or soldered. See valve schedule articles.
- f. Disc: NBR, PTFE.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Examine press fittings to verify they have been properly press.
- F. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION OF VALVES

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Provide support of piping adjacent to valves such that no force is imposed upon valves.
- C. Locate valves for easy access and where not blocked by equipment, other piping, or building components.
- D. Install valves so that stems are horizontal or slope upward from centerline of pipe.
- E. Install valves in position that does not project into aisles or block access to other equipment.
- F. Install valves in position to allow full stem and manual operator movement.
- G. Verify that joints of each valve have been properly installed and sealed to assure there is no leakage or damage.

- H. Check Valves: Install check valves for proper direction of flow.
 - 1. Lift Check Valves: With stem upright and plumb.
- I. Adhere to manufacturer's installation instructions. When soldering or brazing valves, do not heat valves above maximum permitted temperature. Do not use solder with melting point temperature above valve manufacturer's recommended maximum.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Pump-Discharge Check Valves:
 - a. NPS 2 and Smaller: Bronze, swing check valves with bronze or nonmetallic disc.
- B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- C. End Connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded, soldered, or press-end connections.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flange or threaded.
 - 3. For Copper Tubing, NPS 5 and Larger: Flange.
 - 4. For Steel Piping, NPS 2 and Smaller: Threaded.
 - 5. For Steel Piping, NPS 2-1/2 to NPS 4: Flange or threaded.
 - 6. For Steel Piping, NPS 5 and Larger: Flange.

END OF SECTION 220523.14

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. Thermal hanger-shield inserts.
 - 4. Fastener systems.
 - 5. Pipe-positioning systems.
 - 6. Equipment supports.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; maximum weights supported, maximum pipe dimensions supported, support intervals, etc. Include Product Data for components:
 - 1. Trapeze pipe hangers. Include Product Data for components.
 - a. Shop Drawings to be signed and sealed by a qualified professional engineer.
 - 2. Metal framing systems. Include Product Data for components.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as indicated, as defined in applicable Division 01 Sections, to design trapeze pipe hangers and equipment supports.
- 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.

2.2 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
 - 3. Nonmetallic Coatings: Plastic coated or epoxy powder coated.
 - 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 and Tube 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.

2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-58, 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.

2.4 THERMAL HANGER-SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ERICO International Corporation.
 - 2. Pipe Shields Inc.
 - 3. Piping Technology & Products, Inc.
 - 4. Rilco Manufacturing Co., Inc.

- B. Insulation-Insert Material for Cold Piping: ASTM C552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 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 anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Indoor Applications: Zinc-coated or stainless steel.
 - 2. Outdoor Applications: Stainless steel.

2.6 PIPE-POSITIONING SYSTEMS

- A. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.7 MATERIALS

- A. Aluminum: ASTM B221.
- B. Carbon Steel: ASTM A1011/A1011M.
- C. Structural Steel: ASTM A36/A36M carbon-steel plates, shapes, and bars; black and galvanized.
- D. Stainless Steel: ASTM A240/A240M.
- E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. 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 A36/A36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. 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.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. 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.
- J. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
5. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 PAINTING

- A. Touchup: Clean abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in applicable Division 09 Sections.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.5 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- F. Use padded hangers for piping that is subject to scratching.
- G. Use thermal hanger-shield inserts for insulated piping and tubing.
- H. 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 insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 3. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
- I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- J. 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 of up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 - 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11 split pipe rings.
 - 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 - 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 - 6. C-Clamps (MSS Type 23): For structural shapes.

7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- L. 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.
- M. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- N. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- O. Use powder-actuated fasteners instead of building attachments where required in concrete construction.

END OF SECTION 220529

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Pipe labels.
 - 3. Valve tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- C. Valve numbering scheme.
- D. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Products shall be as manufactured by one of the following:
 - a. Seton Identification Products.
 - b. Brimar industries, Inc.
 - c. Marking Services, inc.
 - 2. Material and Thickness: Brass, 0.032-inch, stainless steel, 0.025-inch, aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 3. Letter Color: White.
 - 4. Background Color: Black.

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/2 inch 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

2.2 PIPE LABELS

- A. Products shall be as manufactured by one of the following:
 1. Seton Identification Products.
 2. Brimar industries, Inc.
 3. Marking Services, inc.
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 2. Lettering Size: [Size letters according to ASME A13.1 for piping.

2.3 VALVE TAGS

- A. Products shall be as manufactured by one of the following:
 1. Seton Identification Products.
 2. Brimar industries, Inc.
 3. Marking Services, inc.
- B. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 1. Tag Material: Brass, 0.032-inch, stainless steel, 0.025-inch, aluminum, 0.032-inch, or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass wire-link chain or beaded chain or S-hook.
- C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve

(room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

- A. Pipe Label Locations: Locate pipe labels where piping is exposed in finished spaces; machine rooms; as follows:
 1. Near each valve and control device.
 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 4. Near major equipment items and other points of origination and termination.
 5. Spaced at maximum intervals of 25 feet along each run.
- B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- C. Pipe Label Color Schedule:
 1. Domestic Water Piping
 - a. Background: Safety green.
 - b. Letter Colors: White.

3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 - 1. Valve-Tag Size and Shape:
 - a. Cold Water: 2 inches round.
 - b. Hot Water: 2 inches round.
 - 2. Valve-Tag Colors:
 - a. Cold Water: Natural.
 - b. Hot Water: Natural.
 - 3. Letter Colors:
 - a. Cold Water: White.
 - b. Hot Water: White.

END OF SECTION 220553

SECTION 220593 - TESTING, ADJUSTING, AND BALANCING FOR PLUMBING

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. TAB of Domestic Water system.
 - 2. Testing, Adjusting and Balancing of Plumbing Systems:
 - a. Sanitary sewage pumps.
 - 3. Pipe-leakage test verification.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 PREINSTALLATION MEETINGS

- A. TAB Conference: If requested by the Owner, conduct a TAB conference at Project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.
 - 1. Minimum Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Needs for coordination and cooperation of trades and subcontractors.

- d. Proposed procedures for documentation and communication flow.
- e. Coordination regarding scheduling of areas for turnover to the Owner.
- f. Coordination and scheduling with HVAC Commissioning.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- D. System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.
- E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.
- F. Certified TAB reports.
- G. Sample report forms.
- H. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.

1.6 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
 - 2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.
- B. TAB Specialists Qualifications: Certified by NEBB or TABB.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
 - 2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB as a TAB technician.

- C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.7 PROJECT CONDITIONS

- A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for plumbing systems and equipment.
- D. Examine design data including plumbing system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about plumbing system and equipment controls.
- E. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of plumbing equipment when installed under conditions different from the conditions used to rate equipment performance.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.

- H. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- I. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- J. Examine system pumps to ensure absence of entrained air in the suction piping.
- K. Examine operating safety interlocks and controls on plumbing equipment.
- L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
 - 1. Plumbing systems are filled, clean, and free of air.
 - 2. Automatic temperature-control systems are operational.
 - 3. Equipment access doors are securely closed.
 - 4. Isolating and balancing valves are open and control valves are operational.
 - 5. Domestic Water System:
 - a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed in accordance with applicable code and authority having jurisdiction.
 - b. Piping is complete and all points of outlet are installed.
 - c. Strainers are clean.
 - d. Control valves are functioning in accordance with the sequence of operation.
 - e. Shutoff and balance valves are 100 percent open.
 - f. Suitable access to balancing devices and equipment is provided.
 - 6. Sanitary Sewage/Drainage System:
 - a. Leakage and pressure tests on sanitary sewage/drainage systems have been completed in accordance with applicable code and authority having jurisdiction requirements.
 - b. Piping is complete.
 - c. Sanitary sewage pumps/drainage pumps are operational.
 - d. Control valves are functioning in accordance with the sequence of operation.
 - e. Shutoff valves are 100 percent open.
 - f. Suitable access to equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the equipment manufacturer's recommended procedures and the procedures contained in this Section.

- B. Cut insulation, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. Install and join new insulation that matches removed materials.
- C. Mark equipment and balancing devices, including valve position indicators, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR PLUMBING SYSTEMS

- A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.
- C. Prepare plumbing systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:
 - 1. Open all manual valves for maximum flow.
 - 2. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.

3.5 PROCEDURES FOR CONSTANT-FLOW PLUMBING SYSTEMS

- A. Measure existing water flow at existing recirculation pump (measure flow before the start of any construction and measure final flow per these specifications – provide report for each).
 - 1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
 - a. Monitor motor performance during procedures and do not operate motors in overload conditions.
 - 3. Report flow rate.
- B. Set calibrated balancing valves, if installed, at calculated presettings.
- C. Measure flow at all stations in the area of construction and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.
- D. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:
 1. Determine the balancing station with the highest percentage over indicated flow.
 2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
 3. Record settings and mark balancing devices.
- E. Measure existing pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures.
- F. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.
- G. Check settings and operation of each safety valve. Record settings.

3.6 PROCEDURES FOR THERMOSTATIC MIXING VALVES

- A. Adjust leaving water temperature to setpoint indicated with flow rate in accordance with the valve manufacturer's recommendations.
- B. For valves with recirculation setup, make adjustments until there is no increase in water temperature with the valve operating at a no flow condition. Follow valve manufacturer's written procedures

3.7 TOLERANCES

- A. Set plumbing system's water flow rates within the following tolerances:
 1. Domestic Water Flow Rates: Plus or minus 10 percent.

3.8 REPORTING

- A. Per construction report: Measured Flow and existing pump information.
- B. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to plumbing systems and general construction to allow access for performance measuring and balancing devices.
- C. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and

problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.9 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Pump curves.
 - 2. Manufacturers' test data.
 - 3. Field test reports prepared by system and equipment installers.
 - 4. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 - 1. Title page.
 - 2. Name and address of the TAB contractor.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB supervisor who certifies the report.
 - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 - 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 - 12. Nomenclature sheets for each item of equipment.
 - 13. Notes to explain why certain final data in the body of reports vary from indicated values.
- D. System Diagrams: Include schematic layouts of plumbing distribution systems. Present each system with single-line diagram and include the following:
 - 1. Water flow rates.
 - 2. Pipe and valve sizes and locations.
 - 3. Balancing stations.

4. Position of balancing devices.
- E. Existing Recirculation Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in gpm.
 - g. Water pressure differential in feet of head or psig.
 - h. Required net positive suction head in feet of head or psig.
 - i. Pump rpm.
 - j. Impeller diameter in inches.
 - k. Motor make and frame size.
 - l. Motor horsepower and rpm.
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. Full-load amperage and service factor.
 - p. Seal type.
 2. Test Data (Indicated and Actual Values):
 - a. Static head in feet of head or psig.
 - b. Pump shutoff pressure in feet of head or psig.
 - c. Actual impeller size in inches.
 - d. Full-open flow rate in gpm.
 - e. Full-open pressure in feet of head or psig.
 - f. Final discharge pressure in feet of head or psig.
 - g. Final suction pressure in feet of head or psig.
 - h. Final total pressure in feet of head or psig.
 - i. Final water flow rate in gpm.
- F. Instrument Calibration Reports:
1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.10 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of commissioning authority.

- B. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
 - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 - 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
 - 3. If the second verification also fails, design professional may contact AABC Headquarters regarding the AABC National Performance Guaranty.
- F. Prepare test and inspection reports.

END OF SECTION 220593

SECTION 220719 R1 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 1. Domestic cold-water piping.
 2. Domestic hot-water piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 2. Detail attachment and covering of heat tracing inside insulation.
 3. Detail insulation application at pipe expansion joints for each type of insulation.
 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 5. Detail removable insulation at piping specialties, equipment connections, and access panels.
 6. Detail application of field-applied jackets.
 7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 22 sections.
- 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.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Products that come into contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.
- C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable in accordance with ASTM C795.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- E. Mineral-Fiber, Preformed Pipe: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547.
 - 1. Products shall be as manufactured by one of the following:
 - a. Knauf Insulation.
 - b. Johns Manville; a Berkshire Hathaway company
 - c. Manson Insulation Inc.
 - d. Owens Corning.
 - e.
 - 2. Preformed Pipe Insulation: Type I, Grade A, with factory-applied ASJ-SSL.
 - 3. 850 deg F.
 - 4. Factory fabricate shapes in accordance with ASTM C450 and ASTM C585.
 - 5. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C195.
- B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C449.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- C. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 MASTICS AND COATINGS

- A. Materials shall be compatible with insulation materials, jackets, and substrates.

- B. Vapor-Retarder Mastic, Water Based: Suitable for indoor use on below-ambient services.
 1. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
 2. Service Temperature Range: 0 to plus 180 deg F.
 3. Comply with MIL-PRF-19565C, Type II, for permeance requirements.
 4. Color: White.
- C. Vapor-Retarder Mastic, Solvent Based, Indoor Use: Suitable for indoor use on below-ambient services.
 1. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
 2. Service Temperature Range: 0 to 180 deg F.
 3. Color: White.
- D. Vapor-Retarder Mastic, Solvent Based, Outdoor Use: Suitable for outdoor use on below-ambient services.
 1. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
 2. Service Temperature Range: Minus 50 to plus 220 deg F.
 3. Color: White.
- E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
 1. Water-Vapor Permeance: ASTM E96/E96M, greater than 1.0 perm at manufacturer's recommended dry film thickness.
 2. Service Temperature Range: 0 to plus 180 deg F.
 3. Color: White.

2.5 LAGGING ADHESIVES

- A. Adhesives shall comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
 1. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
 2. Service Temperature Range: 20 to plus 180 deg F.
 3. Color: White.

2.6 SEALANTS

- A. Materials shall be as recommended by the insulation manufacturer and shall be compatible with insulation materials, jackets, and substrates.
- B. ASJ Flashing Sealants and PVC Jacket Flashing Sealants:
 1. Fire- and water-resistant, flexible, elastomeric sealant.
 2. Service Temperature Range: Minus 40 to plus 250 deg F
 3. Color: White.

2.7 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-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.

2.8 FIELD-APPLIED CLOTHS

- A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd.

2.9 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C1136, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness of 30 mils.
 1. Adhesive: As recommended by jacket material manufacturer.
 2. Color: White.
 3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
 - b. Moisture Barrier for Indoor Applications: 1-mil-thick.
 - c. Moisture Barrier for Outdoor Applications: 3-mil-thick.
 - d. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.10 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.
 1. Width: 3 inches
 2. Thickness: 11.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
 - 1. Width: 2 inches.
 - 2. Thickness: 6 mils.
 - 3. Adhesion: 64 ounces force/inch width.
 - 4. Elongation: 500 percent.
 - 5. Tensile Strength: 18 lbf/inch width.

2.11 SECUREMENTS

- A. Bands:
 - 1. Stainless Steel: ASTM A240/A240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, stainless 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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of 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 storage, application, and finishing. Replace insulation materials that get wet.
- 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 attached to structure with vapor-barrier mastic.
 - 3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at 4 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, in accordance with 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 25 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 in similar fashion 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. 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 Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation made from same material and density as that of 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 of same material and thickness as that 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 of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 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 of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 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, mechanical couplings, and unions, using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.
 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, 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.
- 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 that of adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least 2 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.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as that of 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 that of 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.

3.7 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
 - 1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 - 2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
 - 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
 - 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.8 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in applicable Division 09 Sections.
 - 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. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.9 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Tests and Inspections: Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

3.11 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
 - 1. NPS 4 and Smaller: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - b. Vapor barrier required.
- B. Domestic Hot and Recirculated Hot Water (<140 degrees F):
 - 1. NPS 1 and Smaller: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - 2. NPS 1 ¼" to 3": Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1.5 inch thick.
- C. Domestic Hot and Recirculated Hot Water (140 degrees F and greater):
 - 1. NPS 4 and Smaller: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inch thick.

3.12 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. Piping, Concealed above ceiling:
 - 1. None.
- C. Piping, Exposed:
 - 1. PVC: 30 mils 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Copper tube and fittings.
 - 2. Piping joining materials.
 - 3. Dielectric fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Coordination Drawings: Piping layout, drawn to scale, showing all plumbing piping and equipment, and coordinated with other building trades.
- C. Field quality-control reports.

1.5 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 - 1. Notify Architect and Owner no fewer than two days in advance of proposed interruption of water service.
 - 2. Do not interrupt water service without Architect and Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Hard Copper Tube: ASTM B 88, Type K water tube, drawn temper.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- E. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.
- F. Copper, Brass, or Bronze Pressure-Seal-Joint Fittings:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Viega LLC; or a comparable product by one of the following:
 - a. Apollo Flow Controls; Conbraco Industries, Inc.
 - b. NIBCO INC.
 - 2. Fittings: Cast-brass, cast-bronze or wrought-copper with EPDM O-ring seal in each end. Sizes NPS 2-1/2 and larger with stainless steel grip ring and EPDM O-ring seal.
 - 3. Minimum 200-psig working-pressure rating at 250 deg F.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.

2.4 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Nipples:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Grinnell G-Fire by Johnson Controls Company.
 - b. Precision Plumbing Products.
 - c. Sioux Chief Manufacturing Company, Inc.
 - 2. Standard: IAPMO PS 66.
 - 3. Electroplated steel nipple complying with ASTM F 1545.
 - 4. Pressure Rating and Temperature: 300 psig at 225 deg F.
 - 5. End Connections: Male threaded or grooved.
 - 6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve immediately upstream of each dielectric fitting.
- D. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

- G. Install piping to permit valve servicing.
- H. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in applicable Division 22 Sections.

3.2 EARTHWORK

- A. Comply with requirements in applicable Division 22 and 31 Sections.

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- D. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 4 and Smaller: Use dielectric nipples.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for hangers, supports, and anchor devices in applicable Division 22 Sections.
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

- c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
- 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install hangers for copper tubing and piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Support horizontal piping within 12 inches of each fitting.
- D. Support vertical runs of copper tubing and piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in applicable Division 22 Sections.

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 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 authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
2. Piping Tests:
- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - c. 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.
 - d. 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 it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
 - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
- 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.

- B. Clean non-potable domestic water piping as follows:
 - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 - 2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.10 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Aboveground domestic water piping shall be one of the following:
 - 1. Hard copper tube, ASTM B 88, Type L or Type K; wrought-copper, solder-joint fittings; and soldered joints.
- D. Underground domestic water piping shall be the following:
 - 1. Hard copper tube, ASTM B 88, Type L or Type K; wrought-copper, solder-joint fittings; and soldered joints.

3.11 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball valves for piping NPS 4 and smaller.

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. Backflow preventers.
 - 2. Temperature-actuated, water mixing valves.
 - 3. Strainers for domestic water piping.
 - 4. Drain Valves.
 - 5. Flexible connectors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.
 - 1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and

NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 BACKFLOW PREVENTERS

- A. Double-Check, Backflow-Prevention Assemblies:
 - 1. Products shall be as manufactured by one of the following:
 - a. Ames Fire & Waterworks; A WATTS Brand.
 - b. Apollo Flow Controls; Conbraco Industries, Inc.
 - c. WATTS.
 - 2. Standard: ASSE 1015.
 - 3. Operation: Continuous-pressure applications unless otherwise indicated.
 - 4. Pressure Loss: 5 psig maximum, through middle third of flow range.
 - 5. Body: Bronze NPS 2 and smaller.
 - 6. End Connections: Threaded for NPS 2 and smaller.
 - 7. Configuration: Designed for horizontal, straight-through flow.
 - 8. Accessories:
 - a. Valves NPS 2 1/2 and Smaller: Ball type with threaded ends on inlet and outlet.

2.4 TEMPERATURE-ACTUATED, WATER MIXING VALVES

- A. Primary, Thermostatic, Water Mixing Valves:
 - 1. Products shall be as manufactured by one of the following:
 - a. Leonard Valve Company.
 - b. POWERS; A WATTS Brand (Basis of Design).
 - c. Lawler manufacturing, Corp.
 - d. Apollo.
 - 2. Standard: ASSE 1017.
 - 3. Pressure Rating: 125 psig minimum unless otherwise indicated.
 - 4. Control: Water temperature +/-2 degrees F in accordance with ASSE 1017 and during periods of low/zero demand.
 - 5. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
 - 6. Material: Bronze body with corrosion-resistant interior components.
 - 7. Connections: Threaded inlets and outlet.

8. Mounting: Mounted on a heavy duty welded strut with corrosion resistance coating.
9. Testing: factory tested as a complete unit.
10. Accessories: Digital temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control. Digital water temperature control and monitoring system shall feature full-color touchscreen interface with is configurable and does not require factory pre-programming, and inlet strainers. System shall include user programmable high temperature alarm. Controller shall be password protected, adjustable outlet temperature range of 80 to 180 degrees F, digitally monitor inlet pressure and temperature, mixed outlet temperature, mixed outlet setpoint, pressure, return water temperature, control external recirculation pump based on return water temperature, integrate with the building management system through Bacnet and Modbus protocols along with local and remote temperature alarms.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller.
3. End Connections: Threaded for NPS 2 and smaller.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size: Strainers NPS 2 and Smaller: 0.033 inch.
6. Drain: Pipe plug.

2.6 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.7 FLEXIBLE CONNECTORS

A. Products shall be as manufactured by one of the following:

1. Flex-Hose Co., Inc.
2. Metraflex Company (The).
3. Universal Metal Hose.

- B. Stainless Steel-Hose Flexible Connectors: Corrugated-stainless steel tubing with stainless steel wire-braid covering and ends welded to inner tubing.
 - 1. Working-Pressure Rating: Minimum 200 psig.
 - 2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

- A. Backflow Preventers: Install in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 - 1. Locate backflow preventers in same room as connected equipment or system.
 - 2. Do not install bypass piping around backflow preventers.
- B. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.
- C. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.
- D. Y-Pattern Strainers: For water, install on supply side of each control valve, water pressure-reducing valve, and pump.

3.2 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 CONTROL CONNECTIONS

- A. Connect wiring in accordance with applicable Division 26 Sections

3.4 IDENTIFICATION

- A. Plastic Labels for Equipment: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Backflow preventers.
 - 2. Water pressure-reducing valves.
 - 3. Balancing valves.
 - 4. Temperature-actuated, water mixing valves.

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.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections.
 - 1. Test each double-check, backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Hub-and-spigot, cast-iron soil pipe and fittings.
 - 2. Hubless, cast-iron soil pipe and fittings.
 - 3. Copper tube and fittings.
 - 4. Specialty pipe fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, and details.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 FIELD CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
 - 2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

1.6 WARRANTY

- A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 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.

2.2 PIPING MATERIALS

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings:
 - 1. Marked with CISPI collective trademark.
 - 2. ASTM A74, service and extra-heavy cast iron.
- B. Gaskets: ASTM C564, rubber.
- C. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings:
 - 1. Marked with CISPI collective trademark.
 - 2. ASTM A888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
 - 1. Standards: ASTM C1277 and CISPI 310.
 - 2. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Hubless-Piping Couplings:
 - 1. Standards: ASTM C1277 and ASTM C1540.
 - 2. Description: Stainless steel shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.5 COPPER TUBE AND FITTINGS

- A. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

- C. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
2. Shielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. End Connections: Same size as and compatible with pipes to be joined.

B. Dielectric Fittings:

1. Dielectric-Flange Insulating Kits:
 - a. Description:
 - 1) Nonconducting materials for field assembly of companion flanges.
 - 2) Pressure Rating: 150 psig.
 - 3) Gasket: Neoprene or phenolic.
 - 4) Bolt Sleeves: Phenolic or polyethylene.
 - 5) Washers: Phenolic with steel backing washers.
2. Dielectric Nipples:
 - a. Description:
 - 1) Standard: IAPMO PS 66.
 - 2) Electroplated steel nipple.
 - 3) Pressure Rating: 300 psig at 225 deg F.
 - 4) End Connections: Male threaded or grooved.
 - 5) Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
 - 1. 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.
 - 2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
 - a. Straight tees, elbows, and crosses may be used on vent lines.
 - 3. Do not change direction of flow more than 90 degrees.
 - 4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of waste piping in direction of flow is prohibited.
- J. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- K. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- L. Install engineered soil and waste and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
- M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

- N. Install sleeves for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for sleeves specified in applicable Division 22 Sections.
- O. Install sleeve seals for piping penetrations of concrete walls and slabs.
 - 1. Comply with requirements for sleeve seals specified in applicable Division 22 Sections.
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for escutcheons specified in applicable Division 22 Sections.

3.2 JOINT CONSTRUCTION

- A. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

3.3 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in ODs.
 - 2. In Waste Drainage Piping: Shielded, nonpressure transition couplings.
- B. Dielectric Fittings:
 - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - 2. Dielectric Fittings for NPS 4 and Smaller: Use dielectric nipples.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for pipe hanger and support devices and installation specified in applicable Division 22 Sections.
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 3. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 4. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - 5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 6. Base of Vertical Piping: MSS Type 52, spring hangers.

- B. Install hangers for copper soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- D. Support vertical runs of copper soil piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect waste and vent piping to the following:
 - 1. Plumbing Fixtures: Connect waste 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 waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 - 5. Comply with requirements for cleanouts and drains specified in applicable Division 22 Sections.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.6 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in applicable Division 22 Sections.

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 waste 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.
 - a. 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 waste and vent piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
 - a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
 - b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
 - c. 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.
 - a. 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.
 - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
 - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
 - d. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.

3.8 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping 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.
- D. Repair damage to adjacent materials caused by waste and vent piping installation.

3.9 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 2 and smaller shall be the following:
 - 1. Service cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty hubless-piping couplings; and coupled joints.
 - 3. Copper Type DWV tube, copper drainage fittings, and soldered joints.
 - 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, vent piping NPS 2 and smaller shall be any of the following:
 - 1. Copper Type DWV tube, copper drainage fittings, and soldered joints.
 - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 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. Section Includes:
 - 1. Miscellaneous sanitary drainage piping specialties.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile butadiene styrene.
- B. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

- A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

2.2 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

- A. 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.
- B. 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 2 inches 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install air-gap fittings on draining-type indirect-waste piping discharge into sanitary drainage system.
- B. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.

3.2 PIPING CONNECTIONS

- A. Install piping adjacent to equipment, to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

- A. 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.

3.4 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 221319.13 R1 - SANITARY DRAINS

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. Cleanouts.
 - 2. Floor drains.
 - 3. Miscellaneous sanitary drainage piping specialties.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Show fabrication and installation details for frost-resistant vent terminals.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For sanitary waste piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

- A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

2.2 CLEANOUTS

A. Cast-Iron Exposed Cleanouts:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Jay R. Smith Mfg Co; a division of Morris Group International.
 - b. Josam Company.
 - c. WATTS.
 - d. Zurn Industries, LLC.
 - e. Or approved equal in accordance with the project substitution provisions of the contract.
2. Standard: ASME A112.36.2M.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk, cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

2.3 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Jay R. Smith Mfg. Co.
 - b. Josam Company.
 - c. WATTS.
 - d. Zurn Industries, LLC.
 - e. Or approved equal in accordance with the project substitution provisions of the contract.
2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Not required.
6. Anchor Flange: Not required.
7. Clamping Device: Required.
8. Outlet: Bottom.
9. Backwater Valve: Not required.
10. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
11. Sediment Bucket: Not required.
12. Top or Strainer Material: Nickel bronze.
13. Top of Body and Strainer Finish: Nickel bronze.
14. Top Shape: Round.
15. Top Loading Classification: Heavy Duty.
16. Inlet Fitting: Not required.
17. Funnel: Not required.
18. Trap Material: Cast iron.

19. Trap Pattern: Standard P-trap.
20. Trap Features: Waterless Trap Primer.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. 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: 4-inch-minimum water seal.
 - b. NPS 2-1/2 and Larger: 5-inch-minimum water seal.

B. 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Assemble open drain fittings and install with top of hub 1 inch above floor.
- E. Install deep-seal traps on floor drains and other waste outlets, if indicated.

- F. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 - 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 - 2. Size: Same as floor drain inlet.
- G. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- H. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.
- I. Install vent caps on each vent pipe passing through roof.
- J. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.
- K. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.
- L. Install wood-blocking reinforcement for wall-mounting-type specialties.
- M. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 PIPING CONNECTIONS

- A. Comply with requirements in applicable Division 22 Sections for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment, to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

- A. 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.
 - 1. Nameplates and signs are specified in applicable Division 22 Sections.

3.4 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 221319.13

SECTION 221343 – FACILITY PACKAGED SEWAGE PUMPING STATIONS

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. Submersible sump pumps.
 - 2. Sump-pump basins and basin covers.
 - 3. Free standing ejector pump.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
 - 4. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.

- C. Comply with manufacturer's written instructions for handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE 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. UL Compliance: Comply with UL 778 for motor-operated water pumps.

2.2 SUBMERSIBLE SUMP PUMPS

- A. Submersible, Fixed-Position, Recessed Basin, Single-Seal Sump Pumps:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bell & Gossett; a Xylem brand.
 - b. Grundfos Pumps Corp.
 - c. Little Giant; a Franklin Electric brand.
 - d. Zoeller Company.
 - 2. Description: Factory-assembled and -tested sump-pump unit.
 - 3. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 1.1-1.2 and HI 1.3.
 - 4. Pump Casing and motor housing: Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
 - 5. Impeller: Statically and dynamically balanced, ASTM A48/A48M, Class No. 25 A cast iron design for clear wastewater handling, and keyed and secured to shaft.
 - 6. Solids Handling: 5/8" spherical solids.
 - 7. Pump and Motor Shaft: AISI 1215 cold rolled steel.
 - 8. Hardware: Stainless steel, with factory-sealed, grease-lubricated ball bearings.
 - 9. Seal: Mechanical carbon and ceramic.
 - 10. Gasket; Neoprene.
 - 11. Motor: Hermetically sealed, class B, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 - a. Motor Housing Fluid: Oil.
 - 12. Controls:
 - a. Enclosure: NEMA 250, Type 4X wall mounted.
 - b. Switch Type: Mechanical-float or Mercury-float type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.

- c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
- d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float or mercury-float switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm.

13. Control-Interface Features:

- a. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.

B. Submersible, Fixed-Position, Single-Seal Sump Pumps with Free Standing Basin:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bell & Gossett; a Xylem brand.
 - b. Grundfos Pumps Corp.
 - c. Little Giant; a Franklin Electric brand.
 - d. Zoeller Company.
2. Description: Factory-assembled and -tested sump-pump unit.
3. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 1.1-1.2 and HI 1.3.
4. Pump Casing and motor housing: Epoxy coated Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
5. Impeller: Statically and dynamically balanced, ASTM A48/A48M, thermoplastic elastomer.
6. Solids Handling: 2" spherical solids.
7. Pump and Motor Shaft: AISI 1215 cold rolled steel.
8. Hardware: Stainless steel, with factory-sealed, grease-lubricated ball bearings.
9. Seal: Mechanical carbon and ceramic.
10. Gasket; Neoprene.
11. Inlet & Outlet sizes: 2".
12. Liquid temperature: 140F maximum.
13. Motor: Hermetically sealed, class B, permanent split capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
 - a. Motor Housing Fluid: Oil.
14. Controls:
 - a. Enclosure: NEMA 250, Type 4X wall mounted.

- b. Switch Type: Mechanical-float or Mercury-float type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
- c. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float or mercury-float switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm.
- d. Control panel with disconnect.

15. Control-Interface Features:

- a. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
 - 1) On-off status of pump.
 - 2) Alarm status.

2.3 SUMP-PUMP BASINS AND BASIN COVERS

- A. Basins: Factory-fabricated, watertight, cylindrical, basin sump with top flange and sidewall openings for pipe connections.
 - 1. Material: Fiberglass (Parking Garage) & Roto-molded polyethylene ribbed design (Court House).
 - 2. Reinforcement: Mounting plates for pumps, fittings, and accessories.
- B. Basin Covers (Parking Garage) Fabricate metal cover with openings having gaskets, seals, and bushings; for access to pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.
 - 1. Reinforcement: Steel or cast iron, capable of supporting foot traffic.
- C. Basin Covers (Court House) Radial rib design for extra strength, gasketed connection, seals, molded inlet hub, molded handle, alarms, pump access cover, monolithic molded basin top.

2.4 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in applicable division 22 sections.
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. Motors for submersible pumps shall be hermetically sealed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for plumbing piping to verify actual locations of existing sanitary drainage piping connections before sump pump installation.

3.2 INSTALLATION

- A. Pump Installation Standards: Comply with HI 1.4 for installation of sump pumps.

3.3 CONNECTIONS

- A. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test, inspect, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections:
 - 1. Perform each visual and mechanical inspection.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Pumps and controls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 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.

3.6 ADJUSTING

- A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.

- B. Adjust control set points.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain controls and pumps.

END OF SECTION 221429

SECTION 224216.16 R1 - COMMERCIAL SINKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Kitchen/utility sinks.
 - 2. Handwash sinks.
 - 3. Supply fittings.
 - 4. Waste fittings.
 - 5. Sink supports.
 - 6. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
 - 2. Include rated capacities, operating characteristics and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted sinks.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For sinks and faucets to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
 - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 KITCHEN/UTILITY SINKS

A. Kitchen/Utility Sinks - Stainless Steel

1. Source Limitations: Obtain sinks from single source from single manufacturer.
2. Fixture:
 - a. Standard: ASME A112.19.3/CSA B45.4.
 - b. Type: Stainless steel, self-rimming, sound-deadened unit.
 - c. Material: 18 gauge, Type 304 stainless steel.
3. Supply Fittings:
 - a. Standard: ASME A112.18.1/CSA B125.1.
 - b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.
 - 1) Operation: Loose key.
 - 2) Risers: NPS 1/2 chrome-plated, soft-copper flexible tube ASME A112.18.6/CSA B125.6, braided or corrugated stainless steel flexible hose.
4. Waste Fittings:
 - a. Standard: ASME A112.18.2/CSA B125.2.
 - b. Trap(s):
 - 1) Material:
 - a) Chrome-plated, two-piece, cast-brass trap and swivel elbow with 17-gauge brass tube to wall; and chrome-plated brass or steel wall flange.
 - c. Continuous Waste:
 - 1) Material: Chrome-plated, 17-gauge brass tube.

2.2 HANDWASH SINKS

A. Handwash Sinks - Stainless Steel.

1. Source Limitations: Obtain sinks from single source from single manufacturer.
2. Fixture:
 - a. Standards:
 - 1) ASME A112.19.3/CSA B45.4.
 - 2) NSF 61.

- b. Type: Stainless steel basin with radius corners, back for faucet, and support brackets.
- c. Material: 18 gauge, Type 304 stainless steel.
- 3. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
- 4. Waste Fittings: Comply with requirements in "Waste Fittings" Article.
- 5. Mounting Height: Accessible in accordance with ICC A117.1.

2.3 MANUALLY OPERATED SINK FAUCETS

- A. Sink faucets intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.
- B. Commercial Sink Faucets - Manual Type: Single-control mixing, Single-control nonmixing, Two-handle mixing, Pre-rinse.
 - 1. Source Limitations: Obtain sink faucets from single source from single manufacturer.
 - 2. Standard: ASME A112.18.1/CSA B125.1.
 - 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
 - 4. Body Material: Commercial, solid brass, or die-cast housing with brazed copper and brass waterway.
 - 5. Finish: Polished chrome plate.
 - 6. Maximum Flow Rate: 1.5 gpm.
 - 7. Vacuum Breaker: Required for hose outlet.

2.4 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless steel wall flange.
- D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Wheel handle.
- F. Risers:
 - 1. NPS 1/2.
 - 2. ASME A112.18.6/CSA B125.6, braided or corrugated stainless steel flexible hose.

2.5 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.
- C. Trap:
 - 1. Size: NPS 1-1/2.
 - 2. Material:
 - a. Chrome-plated, two-piece, cast-brass trap and swivel elbow with 17-gauge brass tube to wall; and chrome-plated brass or steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water-supply piping and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.
- B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install sinks level and plumb in accordance with rough-in drawings.
- B. Install supports, affixed to building substrate, for wall-hung sinks.
- C. Install wall-mounted sinks at accessible mounting height in accordance with ICC A117.1.
- D. Set floor-mounted sinks in leveling bed of cement grout.
- E. Install water-supply piping with stop on each supply to each sink faucet.
 - 1. Install stops in locations where they can be easily reached for operation.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements per applicable specification sections.

- H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 PIPING 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."

3.4 ADJUSTING

- A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.
- B. Install new batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

- A. After completing installation of sinks, inspect and repair damaged finishes.
- B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed sinks and fittings.
- D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16

SECTION 224500 - EMERGENCY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Eyewash equipment.
 - 2. Water-tempering equipment.

1.2 DEFINITIONS

- A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.
- C. Portable, Self-Contained Emergency Plumbing Fixture: Fixture with flushing-fluid supply.
- D. Tepid: Between 60 and 100 deg F.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.
- B. Shop Drawings:
 - 1. Plans, elevations, sections, and mounting and/or attachment details.
 - 2. Details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.4 INFORMATIONAL SUBMITTALS

- A. Field Quality-Control Submittals:
 - 1. Field quality-control reports.
- B. Emergency fixture third-party certification documentation.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For emergency plumbing fixtures.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ANSI/ISEA Z358.1 for emergency plumbing fixtures including third-party certification of fixtures.
- B. Comply with ASSE 1071 for temperature-actuated mixing valves for plumbed emergency fixtures.
- C. Comply with ASME A112.18.1/CSA B125.1 for water-supply fittings.
- D. Comply with ASME A112.18.2/CSA B125.2 for plumbing waste fittings.
- E. Comply with NSF 61 and NSF 372 for fixture materials that will be in contact with potable water.
- F. Comply with requirements in ICC A117.1 for plumbing fixtures for people with disabilities.

2.2 EYEWASH EQUIPMENT

- A. Eye/Face Wash Units - Deck Mounted, Swivel Type, Plumbed: .
 - 1. Source Limitations: Obtain eye/face wash units, deck mounted, swivel type, plumbed, from single manufacturer.
 - 2. Capacity: Not less than **3 gpm** for at least 15 minutes.
 - 3. Supply Piping: **NPS 1/2** chrome-plated brass or stainless steel with flow regulator and stay-open control valve.
 - 4. Control-Valve Actuator: Movement of spray-head assembly to position over sink.
 - 5. Spray-Head Assembly: Two or four spray heads with offset piping.
 - 6. Receptor: Chrome-plated brass or stainless steel bowl.
 - 7. Mounting: Deck mounted next to sink or Deck mounted on sink.

2.3 WATER-TEMPERING EQUIPMENT

- A. Water-Tempering Equipment - Hot and Cold Water:
 - 1. Source Limitations: Obtain water-tempering equipment, hot and cold water, from single manufacturer.
 - 2. Description: Factory-fabricated equipment with thermostatic mixing valve.
 - a. Thermostatic Mixing Valve: Designed to provide **85 deg F** tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus **5 deg F** throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.

- b. Supply Connections: For hot and cold water.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF EMERGENCY PLUMBING FIXTURE

- A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.
- B. Install fixtures level and plumb.
- C. Fasten fixtures to substrate.
- D. Install shutoff valves in water-supply piping to fixtures, to facilitate maintenance of equipment. Use ball or gate valve if specific type valve is not indicated. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation.
 - 1. Exceptions:
 - a. Omit shutoff valve on supply to group of plumbing fixtures that includes emergency equipment.
 - b. Omit shutoff valve on supply to emergency equipment if prohibited by authorities having jurisdiction.
- E. Install dielectric fitting in supply piping to emergency equipment if piping and equipment connections are made of different metals.
- F. Install thermometers in supply and outlet piping connections to water-tempering equipment.
- G. Install trap and waste piping on drain outlet of emergency equipment receptors that are indicated to be directly connected to drainage system.
- H. Install indirect waste piping on drain outlet of emergency equipment receptors that are indicated to be indirectly connected to drainage system.
- I. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations.

3.3 PIPING CONNECTIONS

- A. Connect cold-water-supply piping to plumbed emergency plumbing fixtures not having water-tempering equipment.
- B. Connect hot- and cold-water-supply piping to hot- and cold-water, water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures.
- C. Directly connect emergency plumbing fixture receptors with trapped drain outlet to sanitary waste and vent piping.
- D. Where installing piping adjacent to emergency plumbing fixtures, allow space for service and maintenance of fixtures.

3.4 IDENTIFICATION

- A. Install equipment nameplates or equipment markers on emergency plumbing fixtures and equipment and equipment signs on water-tempering equipment.

3.5 FIELD QUALITY CONTROL

- A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 5. Emergency plumbing fixtures and water-tempering equipment will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Operate and adjust emergency plumbing fixtures and controls. Replace damaged and malfunctioning fixtures and controls.
- B. Adjust or replace fixture flow regulators for proper flow.
- C. Adjust equipment temperature settings.

3.7 CLEANING AND PROTECTION

- A. Clean emergency plumbing fixtures with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed emergency plumbing fixtures and fittings.
- C. Do not allow use of emergency plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224500

PART 5

MECHANICAL WORK

SECTION 230010 – GENERAL REQUIREMENTS HVAC

1.1 GENERAL

- A. One Building Trade, the Heating, Ventilating and Air Conditioning (HVAC) Building Trade, will be covered by these General Requirements HVAC.
- B. For simplicity, this Building Trade will be referred to further herein as the HVAC Trade Contractor. The HVAC Specifications and all HVAC Drawings, together with all addenda make-up the HVAC Contract Documents, and are a part of the “Project Contract Documents”, as described throughout these specifications.
- C. The term “Electrical Trade” as used in the Contract Documents, means the Electrical Building Trade.
- D. The term “indicated” means all information included, detailed, shown and/or implied on the Contract Documents.
- E. The term “existing” is used generally in reference to renovation projects. On new construction projects, the term “existing” is intended to mean work already in place.

1.2 SCOPE AND OBJECTIVES OF THE HVAC WORK

- A. The Scope and Objectives of the HVAC Work of this Project include, but are not limited to:
 - 1. Selected removals on HVAC equipment, ductwork, piping, insulation, valves and accessories;
 - 2. New HVAC Equipment including packaged rooftop equipment, roof curbs, and accessories;
 - 3. Ductwork;
 - 4. Piping;
 - 5. Ductwork and piping insulation;
 - 6. Testing, adjusting and balancing;
 - 7. Automatic temperature controls;
 - 8. Owner training;
 - 9. Preparation of coordination drawings;
 - 10. Preparation of as-built drawings in AutoCad format;
 - 11. Periodic inspection of completed work to confirm compliance with Contract Documents;
 - 12. Refer to Division 01 Section “Summary” for additional information.

1.3 INTENT OF THE HVAC CONTRACT DOCUMENTS

- A. The intent of the HVAC Contract Documents is to include all items and labor necessary for the proper execution and completion of the Work of the HVAC Trade Contractor. The Contract Documents of all Trades are complimentary to each other; what is required by one shall be as binding as if required by all. Performance of the HVAC Trade Contractor is

required only to the extent consistent with the Project Contract Documents and reasonably inferable from them as being necessary to produce the desired results.

- B. It is expressly stipulated that neither the Drawings nor the Specifications shall take precedence over the other, and it is further stipulated that the Design Professional may interpret or construe the Drawings and Specifications so as to secure in all cases the result most consistent with the needs and requirements of the work. In the event of such ambiguity or discrepancy, the Contractor shall comply with the higher cost product (material plus labor), the more stringent requirement, and supply the better quality or greater quantity of work.

1.4 PROPOSAL PREPARATION

- A. Prior to submitting a pricing quotation/proposal, proceed as follows, and include the following:
 - 1. Visit the site, survey, record, confirm and include in the scope of work, all material and labor necessary to install the equipment and systems specified. Use the Contract Documents as diagrammatic in nature, since they are not intended to show all details which may affect the HVAC bid proposal.
 - 2. Include the work, as applicable, to remove and dispose of conduit, piping, insulation, ductwork, equipment and appurtenances not required for new work, unless otherwise indicated to be abandoned in place.
 - 3. Include all disconnections, removals and temporary provisions required to permit rigging, installation, connection, testing and operation of the new equipment. Include all such provisions whether or not shown, detailed or specified within technical sections of the Contract Documents.
 - 4. Include in the work, the following:
 - a. One Project Manager;
 - b. One Project Foreman;
 - c. Sheet Metal Sketcher.
 - 1) It is recommended that the Sheet Metal Sketcher have a minimum of 10 years of applicable experience. Sheet Metal Sketcher shall prepare all equipment arrangements and layout drawings, and initiate coordination drawings.
 - 5. Detail, layout, coordination and fit of all of HVAC equipment. Plan all disconnections, removals, offsets, temporary provisions, as required, to fit the new equipment into the space, and as required to accommodate maintenance accessibility and service access.
 - 6. Maintain and submit for approval, a written project schedule, on a weekly basis.
 - 7. Organize, administrate, control and log the RFI process for his trade. Where applicable, submit all RFI(s) for master RFI log maintained by Lead/Prime Contractor.

B. In preparing a Bid Price:

1. Thoroughly review and confirm all existing conditions and Contract Document information. Make note in writing of any exceptions, misunderstandings, unclear areas, unclear directions, and any aspects which will prohibit completion of the work, in total. Failing to supply such notice, all bidders will be accountable for having accepted all conditions at the site which affect their work and their costs. By submitting a bid price, the HVAC Trade Contractor certifies that the Contract Documents have been thoroughly reviewed and are sufficient for construction, and that the bidding HVAC Trade Contractor has adequate information to establish and determine his responsibility for materials, methods, costs, and schedule.
2. Incorporate all requirements of all sections of the Contract Documents.
3. Include the following with the Manufacturer's and Sub-Contractor's Lists:
 - a. The name and telephone number of all Sub-Contractors.

1.5 HAZARDOUS MATERIALS

- A. The use of asbestos, PCB's or any material or product containing hazardous materials in the performance of this contract is not permitted. Certify, in writing, that no hazardous material or product containing a hazardous material, has been furnished or installed.

1.6 DRAWINGS AND SPECIFICATIONS

- A. It is the intent of the specifications and drawings to include under each item all materials, apparatus and labor necessary to properly install, equip, adjust and put into perfect operation the respective portions of the installations specified and to so interconnect the various items or sections of the work as to form a complete and properly operating whole.
- B. Any apparatus, machinery, small items not mentioned in detail which are necessary to complete or perfect any portion of the installation in a substantial manner and in compliance with the requirements stated, implied or intended must be furnished and/or installed without extra cost to the Project. This includes all materials, devices or methods peculiar to the machinery, apparatus or systems furnished and/or installed by the HVAC Trade Contractor.
- C. In referring to drawings, figured dimensions take precedence over scale measurements. Verify all wall locations, ceiling heights, elevations, dimensions, etc. on the architectural drawings, where applicable. Discrepancies must be referred to the Design Professional for decision. Certify and verify all dimensions, routings and layouts in the field and on the coordination drawings before ordering material or commencing work.
- D. Any work called for in the specifications, but not mentioned or shown on the drawings, or called for on the drawings, but not mentioned in the specifications, must be furnished and/or installed as though called for in both.
- E. When any device or part of equipment is herein referred to in the singular number, such as "the fan" such reference is deemed to apply to as many such devices as required to complete the installation.

- F. The term "Provide" means "Furnish and Install". Neither term will be used generally in these specifications, but will be assumed. The term "Furnish" means to obtain and deliver to the job site for installation by other trades.

1.7 LAWS, ORDINANCES, REGULATIONS AND PERMITS

- A. The entire HVAC system in all and/or in part must conform to all pertinent laws, ordinances and regulations of all bodies having jurisdiction, notwithstanding anything in these drawings or specifications to the contrary.
- B. Pay all fees and obtain and pay for all permits and inspections required by any authority having jurisdiction in connection with the work under this contract.
- C. Electrical work performed by the HVAC Trade Contractor must comply with the requirements of the National Electrical Code, NFPA and other boards and departments having local jurisdiction. Obtain and pay for an Independent Inspection by an authorized Electrical Inspection Agency (EIA) and by local, municipal and state approving agencies. Inspections performed by the local inspector do not substitute for obtaining Independent Inspection by an authorized independent Electrical Inspection Agency.
 - 1. Qualifications: The EIA is to be an independent company from the HVAC Trade Contractor, registered with the State and a Master certified member of the International Association of Electrical Inspectors.
 - 2. Prepare and submit for review and comment to the Engineer a schedule of inspections to be performed in coordination with the construction schedule.
 - 3. At a minimum, inspections shall be performed at the Rough-in, Progress and Final levels.
 - 4. The EIA shall submit written report for each level of inspection to the Engineer to document compliance with current code requirements, including deficiencies and associated required remedial action.

1.8 TESTS

- A. The following requirements are supplementary to tests specified for individual equipment or systems in other specification sections. Give written notice of date of test in ample time to all concerned.
- B. Concealed or insulated work must remain uncovered until all required tests have been completed; but if construction schedule requires, arrange for partial tests on portions of systems as approved. If a Prime Contractor covers or directs a Sub-Contractor to cover HVAC work prior to completing the required tests, the Prime Contractor is responsible for any additional costs related to completing the required tests.
- C. As soon as conditions permit, conduct preliminary tests of equipment to ascertain compliance with specified requirements. Make needed changes, adjustments and/or replacements as preliminary tests may indicate, prior to acceptance tests.
- D. Conduct pressure, performance and operating tests as specified or required for each system or piece of equipment installed, modified or affected under this contract in

presence of the Engineer or Owner as well as a representative of agencies having jurisdiction.

- E. Obtain Certificates of Approval and/or Acceptance as specified or required in compliance with regulations of agencies having jurisdiction. Work will not be deemed complete until such Certificates have been delivered to the Design Professional.
- F. Prove conclusively, by testing, that HVAC systems operate properly, efficiently and quietly in accordance with intent of drawings, specifications and most widely used construction practices.

1.9 CLEANING

- A. Be responsible for the following:
 - 1. Removal of all lumber, refuse, metal, piping and debris from site resulting from HVAC work.
 - 2. Cleaning drippings created by the HVAC work, from finished work of other Trades.
 - 3. Cleaning, polishing, waxing of HVAC work as required.
- B. After testing, and acceptance of all work by the Design Professional and the Owner, thoroughly clean all HVAC equipment and material to the satisfaction of the Design Professional.

1.10 INSTRUCTING OWNER'S PERSONNEL

- A. After all tests and adjustments have been made, fully instruct the representatives of the Owner in all details of operation of the equipment installed under the HVAC Contract Documents.
- B. Operate HVAC equipment for sufficient length of time to satisfy Design Professional that requirements of Contract Documents have been fulfilled.
- C. Prepare digital recording of each Owner training session on compact disc.

1.11 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide in accordance with the general construction contract documents.
- B. Submit digital format PDF of Operating and Maintenance Instructions to the Design Professional for review and processing prior to submission of the hardcopy submission to the Architect.
- C. Upon completion of the Design Professional's review and processing of digital format PDF of the Operating and Maintenance Instructions, submit the final version of the form of three (3) copies of printed instructions to the Owner. Bind instructions in separate, hardback, 3-ring loose leaf binders.

- D. Prepare instruction books by sections and include detailed Operating and Maintenance Instructions for all components of all systems, including wiring, and piping diagrams necessary for clarity. Identify the covers with the name of the project and the words "Operating and Maintenance Instructions - HVAC".
- E. Each section must have labeled tabs and be clearly marked with equipment or system name and contain detailed parts list data, ordering information therefore and the name, address and telephone number of the closest supply source.
- F. All instructional data must be neatly and completely prepared to the satisfaction of the Engineer.
- G. Provide complete copy of all warranties in separate tab with the binder.
- H. Provide copies of the as-built drawings in the manuals.
- I. Provide copy of each submittal for each piece of equipment on the project, complete with all tag numbers, Contractor's Transmittal Cover Sheet and Design Professionals final Submittal Review Sheet.
- J. Provide compact disc of Owner training sessions with the manuals.
- K. Provide complete copy of the final HVAC Testing, Adjusting and Balancing Report.
- L. Provide complete copy of the HVAC System Commissioning Report, if applicable.
- M. Provide complete copy of the final Automatic Temperature Control (ATC) System Commissioning Report, if applicable.
- N. Provide complete copy of all mechanical equipment/system start-up reports.

1.12 GUARANTEE

- A. All material, equipment and workmanship must be in first class operating condition in every respect at time of acceptance by Owner. Acceptance by the Owner will be by letter written to the HVAC Trade Contractor.
- B. Unconditionally guarantee in writing all materials, equipment and workmanship for a period of one (1) year from date of acceptance by Owner. During the guarantee period, repair or replace, at the HVAC Trade Contractor's expense, any materials, equipment or workmanship in which defects may develop and provide free service for all equipment and systems involved in the contract during this guarantee period. Beneficial use of any system by any of the Trade Contractors during construction does not constitute acceptance by the Owner. Time period of this beneficial use cannot be included in the guarantee period.
- C. Guarantee must also include restoration to its original condition of all adjacent work that is disturbed in fulfilling this guarantee.
- D. All such repairs and/or replacements must be made without delay and at the convenience of the Owner.

- E. Guarantees furnished by Trade Contractors and/or equipment manufacturers must be counter-signed by the related Trade Contractor for joint and/or individual responsibility for subject item.
- F. Manufacturers' equipment guarantees or warranties extending beyond the guarantee period described in item B above must be transferred to the Owner along with the Trade Contractor's guarantees.

1.13 ENTRANCE OF EQUIPMENT

- A. Determine the method of equipment entrance during initial site visit prior to bidding. Do not scale building opening, door widths and equipment or component sizes off the drawings. Determine sizes from site measurements and equipment manufacturer. Include cost of equipment manufacturer's knockdown, use of field assembled equipment, field assembly, all work required for access, removals, replacements, general construction, and the like, as required. During preparation of submittals, verify whether knocked-down or pre-disassembled equipment have been proposed all to the extent required to permit entry of equipment to final location. Verify that the use of field assembled (not pre-assembled) equipment complies with manufacturer's warranty, guarantee, listings and requirements.
- B. Perform all necessary rigging required for completion of HVAC work.
- C. Deliver products to the site properly identified with names, model numbers, types, grades, compliance labels and other information needed for identification. Deliver products and equipment to the site properly weatherproofed.
- D. The Trade Contractor who furnishes or purchases the product or equipment is responsible to provide and maintain protection from the weather, dust, dirt, construction debris, etc. until the project is complete.
- E. For all products and equipment which, when installed, have an opening into the building must be provided with a plywood cover, or similar protection, to prevent debris, rain, etc. from entering the building. The Trade Contractor who installs the product or equipment is responsible for such protection beginning at the time of installation.

1.14 VISITS TO SITE

- A. Due to the nature of the work involved under these Contract Documents, all bidders are recommended to thoroughly examine the site. Coordinate and schedule all site visits with the Owner.
- B. Thoroughly review Contract Documents prior to visiting the site, take Contract Documents to site and thoroughly explore to any extent necessary, the existing conditions as relating to fulfilling the requirements of these Contract Documents.
- C. If discrepancies are noted between requirements of Contract Documents and existing conditions, Trade Contractors must so indicate to Design Professional during bidding period and receive clarification before bidding. Failure to comply with this requirement will result in Design Professional's interpretation during the construction period such that

the Design Professional's decision will be final and binding as the sole interpreter of the contract requirements.

- D. Extras will not be considered for any work relating to connections with existing systems or adaptability of new systems to existing structures.

1.15 REQUESTS FOR INFORMATION, RFI(s)

- A. Manage RFI(s) in a formal manner. Preparation and submission must comply with the process specified herein to be of maximum benefit to the project. RFI(s) which do not comply with this process will be returned without comment.
- B. All RFI(s):
 - 1. Must be submitted in written form to the party designated at the construction phase kick-off meeting;
 - 2. Must be consecutively numbered, dated, and logged as directed, during the kick-off meeting;
 - 3. Those which are follow-up RFI(s), must use the same RFI number, with a sequential submission number;
 - 4. Must list the RFI number of any reference RFI(s) used in the narrative;
 - 5. Must present: background; related drawings; specification articles; room, space locations (as designated on Contract Documents including wing, column line designation, floor designation, and/or north, south, and the like), and must be presented as complete, clearly written thoughts, in legibly printed or typed form;
 - 6. Must be completed by the HVAC Trade Contractor's Designated Project Foreman, under the control and overview of the HVAC Trade Contractor's Project Manager;
 - 7. Must include HVAC Trade Contractor's Project Foreman's suggested resolution to RFI;
 - 8. Must evidence a high level of fluency with the Contract Documents, all job progress correspondence, all Addenda, all Construction Bulletins, and specifically the Mechanical/Electrical Specifications including: all specifications.
- C. The HVAC Trade Contractor's designated Project Manager must demonstrate familiarity with and responsibility for all RFI(s) prepared by the Project Foreman and must periodically submit an initialed log of RFI(s) signifying control of RFI(s) relating to specification and job scope issues.
- D. Issues relating to job scope, work included, methods and means which are either clearly discernable from the Contract Documents and/or clearly the responsibility of the HVAC Trade Contractor must be answered by the HVAC Trade Contractor's Project Manager and resolved between the Foreman and Project Manager prior to resorting to written RFI(s). The work of the Project Manager must evidence: fluency with the methods and means anticipated by the HVAC Trade Contractor during the bid phase to plan and complete the work; fluency with the Contract Documents, and all administrative issues related thereto.
- E. Items or issues which relate to non-compliance to associated codes or regulations must reference code interpretations or the published adopted code or regulation. The

reference must be either an excerpt of the code or regulation, published addenda to the code or regulation, a formal interpretation written by a representative of the associated agency, or letter of non-compliance from the Authority Having Jurisdiction. All cited code requirements must include the applicable code title, code version or date, and code section number designation. If the RFI does not contain the required information, the RFI will be returned without comment.

1.16 AS-BUILT DRAWINGS

- A. Prepare reproducible (paper) and electronic (flash drive) record documents in AUTOCAD .dwg format (Version 2000 or later) in accordance with the requirements in Division 01. Use commercial CAD drafting service if HVAC Trade Contractor does not have CAD capabilities in-house. As an option, if requested by the HVAC Trade Contractor, an electronic copy (AutoCad .dwg format) of any of the Division 23 Contract Drawings may be provided by the Design Professional at a cost of \$250.00, paid in advance, by the requesting Contractor. In addition to the requirements specified in Division 01, indicate the following installed conditions:
1. Ductwork mains and branches, size and location; locations of dampers and other control devices; filters, boxes and terminal units requiring periodic maintenance or repair.
 2. Control devices located and numbered, concealed unions located, and with items requiring maintenance located.
 3. Equipment locations (exposed and concealed), dimensioned from prominent building lines and annotated with permanent equipment number approved by Owner. Include code and equipment service clearances.
 4. Approved substitutions, Addenda and Bulletin Contract Modifications, and actual equipment and materials installed.

1.17 SERVICING OF EQUIPMENT AND SYSTEMS

- A. After work has been completed in accordance with the Contract Documents, and prior to final acceptance tests, each Trade Contractor must have manufacturers or their authorized agents of the equipment installed, completely check their equipment and put equipment into proper operation. In each case, the respective Trade Contractor must have the manufacturers thoroughly check the complete installation of the equipment, furnished by the manufacturer, for proper and correct operation under the service intended.
- B. Six months after final acceptance of the work under the Contract Documents, each of the Trade Contractors must have the manufacturers again check their equipment for proper operation and lubrication. Coincidentally, these Trade Contractors must assure that the Owner is properly instructed in the servicing of the equipment.
- C. Prior to expiration of the guarantee period, each Trade Contractor must check all equipment, materials and systems for which he is responsible, make necessary adjustments and/or replacements, and leave systems in first class operating condition.

1.18 CONTINUITY OF SERVICES

- A. Generally, no actions can be taken by the HVAC Trade Contractor that will interrupt any of the existing building services for these buildings or any other building until previously arranged and scheduled with the Design Professional and Owner.
- B. Should any service be interrupted by the HVAC Trade Contractor, immediately provide all labor, including overtime if necessary, and all material and equipment necessary for restoration of such service, at no additional cost to the Project.

1.19 TEMPORARY FACILITIES, UTILITIES AND HEATING

- A. Refer to the general construction contract documents of these specifications.

1.20 SMOKE AND FIRESTOPPING (GENERAL)

- A. Furnish and install a material or a combination of materials to form an effective barrier against the spread of flame, smoke and gases, and to maintain the integrity of the "fire and/or smoke" rated construction. Refer to the general construction contract documents of these specifications. Fire and smoke rated construction is identified on the general construction contract documents. Provide firestopping in the following locations:
 - 1. Pipe, ductwork and conduit penetrations through above grade floor slabs and through "fire and/or smoke"-rated partitions and fire walls.
 - 2. Penetrations of vertical shafts including, but not limited to pipe chases, duct chases, and utility chutes.
 - 3. Other locations where indicated or required.
- B. Prepare submittals and submit for approval. Include manufacturer's descriptive data, typical details, installation instructions and the fire/smoke test data and/or report as appropriate for the time rated construction and location. The fire/smoke test data must include a certification by a nationally recognized testing authority that the material has been tested in accordance with ASTM E 814, or UL 1479 fire tests.
- C. Deliver materials in the original unopened packages or containers showing name of the manufacturer and the brand name. Store materials off the ground, and protect from damage and exposure to elements. Damaged, deteriorated or outdated shelf life materials shall not be used and must be removed from the site.

1.21 COORDINATION DRAWINGS

- A. The HVAC Trade Contractor must initiate preparation of coordination drawings, control original reproduces, collect, organize and facilitate the work/input of General Construction Trade Contractor and all other building trades, as applicable, relative to the 100% final submission of the coordination drawings. Prepare coordination drawings in accordance with Division 01, to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of equipment and materials in relationship with other systems, installations, and building components. Use proposed equipment submittals, which

include certified dimensions, service clearances, etc., to prepare the coordination drawings. If equipment is submitted for review after completion of the coordination drawings and rejected during the submittal review process, because the equipment fails to meet the project specifications, the HVAC Trade Contractor is responsible to revise the coordination drawings and layout the work using equipment which meets the project specifications. Designate all specified return air plenums, locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Indicate the proposed locations of piping, ductwork, equipment, and materials. Include the following:
 - a. Clearances for installing and maintaining insulation.
 - b. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
 - c. Equipment connections and support details.
 - d. Exterior wall and foundation penetrations.
 - e. Fire-rated wall and floor penetrations.
 - f. Sizes and location of required concrete pads and bases.
 - g. Service clearance for equipment behind access doors.
 - h. Location of structural columns, beams and supports.
2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls and ceilings and their relationship to other penetrations and installations.
4. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling mounted items.
5. The foregoing information and coordination work must be provided by the applicable Trade Contractor using the coordination drawings as initiated by the HVAC Trade Contractor.
6. The HVAC Trade Contractor must submit completed coordination drawings for record purposes, not for technical review and approval, but as proof that the coordination drawings have been completed. The coordination drawings must be completed and submitted for record in advance of submission of sheet metal shop drawings.

1.22 TRADE CONTRACTOR'S CERTIFICATION

- A. Upon final completion of all work, each Trade Contractor must provide a notarized letter on Corporate letterhead, executed by a Corporate Officer, or Company Partner, stating that the work has been completed in accordance with the Contract Documents, Addenda, Bulletins, Trade Contractor's Punch List items and Design Professional's Construction Observation Report(s). Final Payment will not be approved until the notarized letter has been provided. Refer to the following sample letter.

SAMPLE LETTER

ENGINEER/ARCHITECT _____

TRADE CONTRACTOR _____

PROJECT _____ NO. _____

I hereby certify that all work under the HVAC, Plumbing, Fire Protection and Electrical Contract Documents, as applicable, including all addenda, bulletins, Punch List items and Construction Observation Reports, has been completed and the quality and workmanship of the work has been performed in accordance with Contract Documents.

State of: _____

County of: _____

Trade Contractor:

Subscribed and Sworn to before
me this _____ day of
20 _____

Notary Public:

By: _____

My Commission Expires:

Date: _____



PART 2 - PRODUCTS

2.1 MANUFACTURER'S AND SUB-CONTRACTORS LIST

- A. Before ordering any material or equipment unit, and not later than ten (10) working days after signing of contracts, submit a list of Manufacturers, Sub-Contractors and Suppliers showing make, type, manufacturer's name and trade designation of all materials, and equipment, proposed for use under this contract. Prepare list by reference to specifications. Identify all long lead submittals which will require an expedited submittal review.
- B. Refer to the Article "Proposal Preparation," in this section. Specifically designate the labor force required of the HVAC Trade Contractor. As part of the mobilization phase of the work, submit resumes for each Keyman including the Project Manager, Project Foreman and Sheet Metal Sketcher. The Sheet Metal Sketcher's resume must be submitted and approved by the engineer prior to the preparation of sheet metal shop drawings.
- C. These lists, when approved, will be supplementary to specifications, and no variations therefrom will be permitted except with the approval of the Engineer.

- D. Prepare the list using the “PROPOSED MANUFACTURERS AND SUB-CONTRACTORS LIST” located at the end of this section.
- E. Submittals will not be processed until the requirements of this Article are satisfactorily completed.

2.2 SUBMITTALS

- A. Provide digital submissions (.pdf format) for all material and equipment as noted in Proposed Manufacturer's and Sub-Contractors List, except where indicated otherwise herein.
 - 1. Prior to submission of product data, shop drawings, and samples, notify the Design Professional of any site conditions differing from those indicated or specified.
 - 2. Prior to submission of product data, shop drawings and samples to the design professional, the HVAC Trade Contractor shall submit all submittals which require electrical power to the Project Electrical Trade Contractor for the HVAC Trade Contractor's and the Electrical Trade Contractor's coordination and review. Electrical Trade Contractor shall provide approval of electrical power requirements for the HVAC Trade Contractor's proposed equipment.
 - 3. All submittals of equipment requiring electrical power must be accompanied by the “HVAC AND ELECTRICAL CONTRACTORS' COORDINATION OF HVAC EQUIPMENT ELECTRICAL REQUIREMENTS TRANSMITTAL COVER SHEET” located at the end of this section. Submittals without this Cover Sheet or an incomplete Cover Sheet will be rejected without review.
 - 4. All submittals must be accompanied by the “HVAC CONTRACTOR'S TRANSMITTAL COVER SHEET” located at the end of this section. Submittals without this cover sheet or with an incomplete cover sheet, will be rejected without review.
 - 5. All submittals must be accompanied by the “HVAC SUBMITTAL LOG”, located at the end of this section. Submit log after final acceptance of the proposed Manufacturer's and Sub-Contractor's list. Revise and update the log with each submittal. Submittals without these logs or without an updated log will be rejected without review.
 - 6. Specifically annotate and sign all exceptions, deletions and additions that vary from the Project Contract Documents. Failing to provide signed annotations for all deletions and additions, recognize and accept that Contract Documents will govern, and will be used to resolve disputes.
- B. Prepare submittals by careful reference to: drawings and specifications; preparatory layout of all work; coordination with all proposed equipment; coordination with related submittals and the work of all other Trade Contractors; space requirements; and Utilities defined in this Section. A review of such submittals by the Design Professional, which include drawings, schedules, and catalog cuts provided by the HVAC Trade Contractor, his Sub-Contractors, manufacturers, and vendors, shall not relieve the HVAC Trade Contractor from the responsibility for correcting all errors of any sort in the submittals, either identified or undetected by such review.

- C. Regularly provide and update submittal log sheets listing submittal number, product, applicable specification section, dates of submittal and receipt and status. Identify each submittal by Job Name, log number and reference to applicable Specification Article number.
- D. All equipment submittals must include, but not be limited to, the following:
1. Manufacturers' catalog designation, photographs and specifications.
 2. Full electrical data, including specifically, electrical characteristics.
 3. Full General Construction data, including operating weights, dimensional data including service access space. Data shall be given to the General Construction Trade Contractor, where applicable, for his use in setting steel, supports, and attachments.
 4. Full wiring diagrams, including clearly identified power connections and control connections. Data and diagrams shall be given to the Electrical Trade Contractor and Automatic Temperature Control (ATC) Trade Sub-Contractor for their use and inclusion into their submittals.
 5. Listing of specific HVAC performance, calculations and data.
 6. Dimensions, capacities, ratings, material and finish.
 7. Complete the submittal by listing all available options, accessories, configurations and materials, and legibly strike out with single thin line all proposed deletions. Clearly signify whether each and every manufacturer's option, accessory, configuration and material choice is included and which is excluded by the submission.
 8. Annotation of equipment, devices, systems as indicated by the Contract Documents (KEF-1,DOAS-1, etc.).
 9. Certification of testing by agencies such as ETL, ARI, UL, etc.
 10. Such other detailed information as required for proper evaluation.
- E. Review Time:
1. Allow two (2) weeks after Design Professional's receipt for the Design Professional's processing of each submittal, exclusive of Owner's, or other's review in the processing chain. Allow a longer time period where processing must be delayed for coordination with subsequent submittals.
- F. Submittals for electric motor starters must include a tabulation listing the following:
1. The equipment the starter is intended to control.
 2. Horsepower and starter size.
 3. Voltage.
 4. Phase.
 5. Full load amperes.
 6. The manufacturer's number or type.
 7. Heater numbers and amperage.
 8. Quantity of auxiliary contacts required by ATC and fire alarm systems.
 9. Pushbutton arrangement.
 10. Pilot light arrangement if applicable.

- G. Submittals for automatic temperature controls must be coordinated with: 1) all HVAC equipment manufacturers' and vendors' submittals including review of HVAC submittals by ATC Sub-Contractor for conformance with sequences of operation for each piece of equipment; 2) all electrical requirements of ATC System with Electrical Trade Contractor; and 3) all fire and safety requirements of the Fire Alarm System. ATC submittals shall include copies of all wiring diagrams for all HVAC equipment with points of connections clearly identified. ATC submittals shall not be developed and submitted until HVAC Trade Contractor provides all equipment submittals for review.
- H. The Design Professional's recommendation of acceptance of the equipment proposed by the HVAC Trade Contractor is conditional upon the HVAC Trade Contractor fulfilling all obligations of the Contract Documents. By furnishing the proposed equipment, the HVAC Trade Contractor acknowledges compliance with all of the following:
1. Field layout is completed and planning of proposed equipment has coordinated with all related submittals, related trades and space requirements.
 2. The HVAC Trade Contractor has reviewed and approved all submittals prior to submission. Provide all submittals with a signed approval stamp, signifying the following: 1) all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data have been verified; 2) the Design Professional has been notified of all site conditions which affect the work, and which require design resolution, as opposed to resolution by trade decisions; 3) all items are approved by the HVAC Trade Contractor, and have been coordinated and checked with other applicable submittals, and contract requirements; 4) submission is clearly marked to indicate which manufacturer's options are provided and which are not provided for the proposed equipment; and 5) manufacturers and/or equipment suppliers have been given a set of the contract documents for their review and use as the basis of the submittals.
 3. Any and all exceptions requested by the HVAC Trade Contractor are provided in writing with the submittals. All exceptions, deletions and additions that vary from the Contract Documents have been specifically annotated and initialed. Failing to provide initialed annotations for all deletions and additions, the HVAC Trade Contractor accepts the condition that the Contract Documents will govern, and will be used to resolve disputes.
 4. Submittals without the HVAC Trade Contractor's signed stamp of approval will be returned without review. Initialed approval stamps are not acceptable.
 5. The Design Professional's acceptance of the proposed equipment constitutes the Design Professional's formal approval that the engineering performance and operational utility requirements, of the proposed equipment, match the Design Professional's specified and designed performance requirements. By entering into this Contract, the HVAC Trade Contractor agrees that the purpose of submittals is to demonstrate to the Design Professional that the HVAC Trade Contractor understands the design concept and that he demonstrates his understanding by indicating which materials and equipment he intends to furnish and install and use.
- I. Secure submittals smaller than 8-1/2 x 11 to paper of this size.
- J. Material and equipment fabricated, furnished and/or installed or used without the Design Professional's review are subject to rejection by the Design Professional.

- K. Prepare 1/4" minimum scale sheet metal shop drawings at the earliest practicable time and coordinate these drawings with the other Trade Contractors prior to erection or fabrication of the sheet metal work in order to effect timely resolution of all conflicts with the work of other Trade Contractors. Do not initiate sheet metal shop drawing preparation until the resume for the Sheet Metal Sketcher has been reviewed and approved by the Design Professional. See Article "Initial Application for Payment" in this section. Sheet metal shop drawings shall cover all metal work on the project, including but not limited to environmental air, exhaust air, make-up air, and products of combustion venting systems. Designate on sheet metal shop drawings all specified return air plenums, fire dampers, and smoke dampers. Designate all transfer air openings specified under General Construction, by reference to general construction drawings detailing fire rated assemblies, and smoke dampers. Refer to Article "Coordination Drawings," in Part 1 of this section.
- L. Corrections or comments made on submittals during review by the Engineer do not relieve the HVAC Trade Contractor from compliance with the requirements of the Contract Documents. Such review will be only for general conformance with the design concept, and the information given in the Contract Documents and does not include review of quantities, dimensions, sizing, pressure drops, weights or gauges, fabrication processes, construction methods, coordination with the work of other trades, or construction safety precautions, all of which are the sole responsibility of the HVAC Trade Contractor. Review of a specific item does not indicate acceptance of an assembly of which the item is a component. The Design Professional is not responsible for any deviations from the Contract Documents that are not clearly noted by the HVAC Trade Contractor. The Design Professional will not review partial submissions or those for which submissions for correlated items have not been received. The HVAC Trade Contractor is responsible for: confirming and correlating all quantities, clearance, and dimensions; selecting fabrication processes and techniques of construction; coordinating work with all other Trades, and performing his work in a safe and satisfactory manner.
- M. All submittals must be able to be reproduced. The HVAC Trade Contractor is responsible for all reproduction and distribution to the General Construction Trade Contractor and all other Trade Contractors as applicable.
- N. If requested for the HVAC Trade Contractor's use in the preparation of submittals, an electronic copy (AutoCad .dwg format) of any of the HVAC Contract Drawings may be provided by the Design Professional, after receipt of a signed indemnification agreement, at a cost of \$250.00, paid in advance, to the HVAC Trade Contractor.
- O. For additional requirements regarding submittals, refer to Article "Additional Trade Contractor Paid fees and Expenses" in Part 3 of this section.

2.3 MATERIALS AND EQUIPMENT

- A. All materials and equipment must be new and conform to the grade, quality and standards specified herein.
- B. All equipment offered under these specifications is limited to products regularly produced and recommended for service ratings in accordance with engineering data or other comprehensive literature made available to the public and in effect at the time of opening

of bids. Testing agency seals, decals and/or nameplate shall be attached to and visible on all equipment.

- C. Items such as valves, motors, starting equipment, vibration isolating devices, and all other equipment and material, where applicable and practicable, must each be of one manufacturer.
- D. Install equipment in strict accordance with manufacturer's instructions for type and capacity of each piece of equipment used. Obtain these instructions, which will be considered part of these specifications. Type, capacity and application of equipment must be suitable and operate satisfactorily for the purpose intended in the HVAC systems.

2.4 EQUIPMENT VARIATIONS AND SUBSTITUTIONS

- A. Equipment Substitution Definition as follows:
 - 1. A product that is neither the Basis of Design, nor one of the named Alternative Manufacturing Sources.
 - 2. Unless noted otherwise in the Contract Documents, substitutions may be considered after the award of Contracts. Subsequent requests will be considered only when, through no fault of the HVAC Trade Contractor, none of the specified products are available.
- B. Equipment Variation Definition as follows:
 - 1. A product that is not the Basis of Design, but is named as one of the specified Alternative Manufacturing Sources.
- C. The manufacturers listed in Part 2 of all technical specifications are considered Alternative Manufacturing Sources as described in Paragraphs A and B above.
- D. "Subject to compliance", as used in these specifications, means compliance with all the requirements of the Contract Documents.
- E. The materials and products mentioned in these Contract Documents are specified to establish a standard of: material of manufacture; independent testing agency certifications; quality; function; design; and performance. The phrases "Basis of Design," "standard of design," and "equivalent acceptable," are used to indicate that other similar, comparable products may be used provided such substitutes or variations are accepted by the Design Professional as meeting all the salient characteristics and standards necessary, such as: material of manufacture; independent testing agency certifications; quality; function; design; and performance, to meet the Owner's needs and meet the objectives of the Design Professional's Project Design.
- F. Where Alternative Manufacturer Sources are listed for an item:
 - 1. Selection must be either the Basis of Design or one of those listed Alternative Manufacturing Sources.
 - 2. There is no guarantee implied that each and every manufacturer listed can meet or exceed the salient characteristics, such as: material of manufacture; independent

testing agency certifications; quality; function; design; and performance of the product specified as Basis of Design.

- G. Each Trade Contractor is responsible to contact his proposed equipment manufacturer's representative and confirm, prior to preparing submittals, the proposed manufacturer's product meets or exceeds the: material of manufacture; independent testing agency certifications; quality; function; design; and performance of the product specified as the Basis of Design. Final acceptance will be determined by the Design Professional, whose decision is final.
- H. Submittals offered as an Equipment Variation from the Basis of Design shall include a letter, on the product manufacturer's letterhead, certifying that the proposed product is a Comparable Product to the product specified as the Basis of Design and conforms to all the salient characteristics, including: material of manufacture; quality; function; design; and performance of the product specified as the Basis of Design. If directed by the Engineer for Products offered as an Equipment Variation, the Offerer shall provide a Letter of Confirmation from a Registered, Professional Engineer attesting that the Proposed Equipment Variation conforms to all the salient characteristics, including: material of manufacture; independent testing agency certifications; quality; function; design; and performance of the product specified as the Basis of Design.
- I. Specific products specified without use of the term: equivalent(s); comparable products; or substitutions constitute a proprietary specification, and must be provided as specified, unless a written request is submitted to the Design Professional for approval up to ten (10) days after the date of project award. Such requests must include a complete description of the proposed product, along with sufficient documentation and other information necessary for a complete evaluation of the proposed product. Such Trade Contractor Requests shall include a letter, on the product manufacturer's letterhead, certifying that the proposed product is a Comparable Product and conforms to all the salient characteristics, including: material of manufacture; independent testing agency certifications; quality; function, design; and performance of the specified product. If approved, the proposed product will be listed in an addendum to notify all bidders that such acceptance has been granted by the Design Professional. If not approved, provide the specified product.
- J. Provide Calculations, signed and sealed by a Professional Engineer registered in the State in which the work is taking place, engaged by the HVAC Trade Contractor, confirming that the equipment proposed as either a Substitution, or Variation, is a Comparable Product to the product specified as the Basis of Design and conforms to all the salient characteristics, including: material of manufacturer; independent testing agency certifications; quality; function; design; and performance of the product specified as the Basis of Design. Provide such calculations for major pieces of equipment (boilers, air handling units, chillers, etc.). The Engineer, whose decision will be final, will determine which products will require calculations during the submittal review process.
- K. The Contract Documents have been founded upon Engineering Design selection of materials, products, and pieces of equipment listed at the Basis of Design. In the event that the incorporation of an approved Substitution, Variation, or assembly, into the work, requires revisions or additions to the contractual requirements of either the Trade Contractor proposing the substitution or variation, or any other Trade Contractor, the Trade Contractor proposing the substitution or variation, shall bear the cost of: such

revisions or additions to the work of the Trade Contractor proposing such Substitution and/or Variation; any expenses of all affected trades; and all engineering or architectural services required at no change in the contract sum.

- L. The equipment specifications indicated on the drawings, or in Part 2 of each of the technical specifications, may or may not indicate or include all of the required salient characteristics, components and accessories included with the specified product. Include cost for all such characteristics, components and accessories required to meet or exceed the: material of manufacture; independent testing agency certifications; quality; function; design; and performance of the product specified as the Basis of Design.
- M. For requirements regarding equipment variations after bid award, refer to Article "Additional Trade Contractor Paid Fees and Expenses" in Part 3 of this section.
- N. Each Trade Contractor negotiating for pricing advantages affecting the Trade Contractor's Bid shall comply with the directives included herein, bear full responsibility for the accuracy and completeness of the submissions required of the Vendor selected by the Trade Contractor. The Proposing Trade Contractor shall bear full responsibility for all extra costs of the Design Professional shown to have resulted from inaccurate, and/or incomplete compliance with the directives included in this Specification Article.
- O. All decisions provided by the Design Professional, described herein, shall be final.

2.5 VIBRATION ELIMINATION

- A. Provide vibration isolation support provisions for all moving or rotating equipment, machinery and transformers when such provisions are not furnished and/or integrally mounted by the equipment manufacturers. Install in accordance with vibration isolation manufacturer's recommendations unless specified otherwise herein.
- B. Subject to compliance with the requirements, provide products by one of the following:
 - 1. Amber/Booth Company;
 - 2. Korfund Company, Inc.;
 - 3. Mason Inc.
 - 4. Or approved equal in accordance with the project substitution provisions of the contract.
- C. Provide all rotating or moving machinery or equipment mounted on, or suspended from, building structure with approved resilient suspension isolation mountings.
- D. Use flexible metallic conduit for all electrical connections to moving or vibrating equipment, such as motors, fans and the like.
- E. Rigid pipes, ducts, conduit or other extended machine assemblies connected to vibration isolated equipment are not permitted to be tied in directly with the building construction. Connect such elements to the equipment through flexible fittings, and support using isolating equipment as required.

- F. All systems must operate free from objectionable vibration and noise. Take all necessary steps required to achieve this result without additional cost to the Project.

2.6 INSERTS, HANGER SUPPORTS, CLAMPS, FASTENINGS

- A. All materials, designs and types of inserts, hanger supports and clamps must meet the requirements of the latest edition of the Manufacturers Standardization Society Document MSS-SP-58, Underwriters Laboratories, Inc., National Electrical Code and Factory Mutual Engineering Division Standards where applicable. Insert, hanger support and clamp types referenced herein are shown in MSS-SP-58.
- B. Provide all necessary inserts, hanger supports, fastenings, clamps and attachments necessary for support of the HVAC work. Select the types of all inserts, hanger supports, fastenings, clamps and attachments to suit both new and existing building construction conditions specifically for the purposes intended.
- C. Clamps and attachments to steel beams and bar joists must be made using types 20, 21, 23, 25, 27, 28, 29 or 30 as applicable to suit conditions of construction. Clamps and attachments must be selected on the basis of the required load to be supported. Provide all necessary steel angle iron or channel between bar joists, or steel beams where direct attachment cannot be made. Holes are not permitted to be drilled or burned in structural building steel for hanger rod supports. Welding of hangers or supports to structural steel is prohibited unless approved beforehand by a Structural Engineer.
- D. Provide metallic masonry anchors for all pre-cast concrete, masonry and cast concrete construction. Locate in pre-cast and cast-in-place concrete as directed by the Design Professional. Select and install as recommended by the anchor manufacturer for the various applications, stresses and services involved. Installation of masonry anchors must be accomplished by pre-drilling concrete or masonry to diameters and depths required to properly accommodate anchor bolts.
- E. Subject to compliance with the requirements, provide products by one of the following:
 - 1. Dynabolt;
 - 2. Ram-In;
 - 3. Tru-Bolt;
 - 4. Redhead;
 - 5. Hilti;
 - 6. Wej-it.
 - 7. Or approved equal in accordance with the project substitution provisions of the contract.
- F. Toggle bolts may be used in dry wall and lath and block plaster walls. The use of toggle bolts is restricted to the weight limitations imposed by the toggle bolt manufacturer for the size used.
- G. Except where noted otherwise herein, attachment to wood or material of similar fibrous nature must be made with lag screws and/or wood screws of required size.

- H. Screws with wooden or plastic plugs, or lead anchors are not acceptable.

2.7 CONDUIT SLEEVES

- A. Provide all sleeves required for HVAC work and be fully responsible for the final and permanent locations thereof.
- B. Provide sleeves in the following locations:
 - 1. All conduits passing through all cast-in-place concrete construction and masonry walls.
 - 2. All conduits passing through cast-in-place waterproof concrete construction and waterproof masonry walls.
- C. Extend through construction and finish flush with each surface except where noted otherwise. Provide for a minimum 1/2" clearance around conduit, pipe or its covering in the instance of pipe covered with insulation.
- D. All sleeves in waterproof walls and floors must be fitted and sealed with positive hydrostatic mechanical seals. Sleeves must be sized accordingly. Mechanical seals must be placed around piping and/or conduit and inserted into void between inner wall of sleeve and conduit. Tighten mechanical seals as required for watertight seal.
- E. Subject to compliance with the requirements, provide products by one of the following:
 - 1. Thunderline Corporation;
 - 2. Advance Products and Systems, Inc.;
 - 3. Proco Products, Inc.
 - 4. Or approved equal in accordance with the project substitution provisions of the contract.
- F. All sleeves must be Schedule 40 steel pipe finished with smooth edges. Sleeves in waterproof walls and floors must be fabricated with minimum 1/4" thick rectangular steel plate placed around mid-point of sleeve, continuously welded to sleeve and then place the entire/plate assembly into proper position prior to erection of walls and floors. Otherwise, provide sleeves with a minimum of three (3) lugs for anchoring.
- G. Pack voids between sleeves, conduit, where located in fire or smoke rated assemblies, in accordance with UL Fire Resistance Directory.
- H. Set all sleeves prior to or during erection of walls and floors. In the event that sleeves are omitted or incorrectly located in new walls or slabs, submit a location plan and method of cutting and installing sleeves to the Design Professional for review prior to carrying out the work.
- I. If sleeves are omitted or located incorrectly, the particular Trade Contractor who is at fault, at his own expense, must engage the trade which originally installed the work, to cut and patch to the satisfaction of the Design Professional.

- J. Provide mechanical seals and insert into voids between conduits that pass through floors, and which will be exposed in finished areas that have floor drains, including spaces classified as "Janitors Closets," "Toilet Rooms," and the like.
- K. Where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine, such as a masonry saw or core drill, to insure a neat hole.

2.8 SMOKE/FIRESTOPPING (MATERIALS)

- A. Firestopping materials and systems must consist of commercially manufactured products complying with the following minimum requirements and be asbestos and PCB free:
 - 1. Flame Spread Index: Twenty-five or less when tested in accordance with ASTM E 84.
 - 2. Smoke Density Index: Fifty or less when tested in accordance with ASTM E 84.
 - 3. Nontoxicity: Nontoxic to human beings at all stages of application and during fire conditions.
 - 4. Systems shall comply with Underwriter's Laboratory Listing Requirements.
 - 5. Fire Resistance:
 - a. Materials and systems used to seal penetrations in time rated assemblies must be capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 time temperature fire conditions for 3 hours.
 - b. Materials must not require a rise in temperature to install or activate seal.
 - c. Materials must not contain solvents or require hazardous waste disposal.
 - d. Firestop material must not dissolve in water after curing.
- B. Subject to compliance with the requirements, provide products by one of the following:
 - 1. Rectorshield, Inc.;
 - 2. Hilti;
 - 3. 3M.
 - 4. Or approved equal in accordance with the project substitution provisions of the contract.
- C. Smoke stopping materials must be approved by the authority having jurisdiction.

PART 3 - EXECUTION

3.1 METHOD OF PROCEDURE

- A. The drawings accompanying these specifications are diagrammatic and intended to cover the approximate and relative locations of the building systems.

- B. Installation, connection and interconnection of all components of these systems must be complete and made in accordance with the manufacturers' instructions and best trade practices.
- C. Erect all parts of equipment furnished at such time and in such manner as not to delay or interfere with other Trade Contractors and their work.
- D. Plug all piping, conduit and ductwork as required during construction to prevent entering of dirt.
- E. Before material is ordered or fabricated, or any work is performed, verify all calculations, sizing, measurements, including lines, grades, pipes, conduit and ductwork elevations at the building, as applicable, and be responsible for the correctness thereof. No extra compensation will be allowed on account of differences between actual dimensions, routing and measurements and those indicated in the Contract Documents. Any discrepancies discovered must be submitted to the Design Professional for consideration before proceeding with the work.
- F. Lay out work and be responsible for the establishment of heights, grades, and the like, for all interior and exterior equipment and systems as applicable, including piping, drains, fixtures, conduit, ductwork, and the like, included in Contract Documents, in strict accordance with the intent expressed thereby; and all the physical conditions to be met at the building and finished grade, and be responsible for accuracy thereof. The establishment of the location of all work must be performed in consideration of the finished work. In case of conflict, equipment and/or materials must be relocated without cost to the Project, as directed by the Design Professional, regardless of which equipment was installed first. Refer to Article, "Coordination Drawings", in Part 1 of this section.
- G. Cooperate with other Trade Contractors for the proper securing and anchoring of all work included within these specifications. Use extraordinary care in the erection and installation of all equipment and materials to avoid marring surfaces of the work of other Trade Contractors, as each Trade Contractor will be held financially responsible for all such injury caused by the lack of precaution and due to negligence on the part of his workmen.
- H. All ductwork, conduit and other materials and equipment shown to be mounted below ceilings are to be kept as close to ceiling areas as possible unless otherwise noted.
- I. Install and arrange all equipment, such as dampers, cleanouts, traps, junction boxes, and the like, which will be concealed in construction, to be fully accessible for adjustment, service and maintenance. Furnish access doors where required for installation under the General Construction Contract, where applicable. Otherwise, furnish and install all required access doors.

3.2 PROTECTION OF WORK

- A. All equipment, materials and accessories having polished or plated surfaces, machined finishes or unpainted surfaces must be given a thick coat of a neutral protection grease and carefully covered with thick cloth or heavy building paper held securely in place to protect the finish against damage during the entire period of construction. Protect

equipment by the use of canvas tarps, vinyl sheeting or similar materials held securely in place.

- B. Seal all openings in fittings, ductwork, conduit and all other materials to exclude dirt, sand, and other foreign materials.
- C. Exercise every precaution to exclude dust, dirt and all other foreign materials from switchgear rooms, transformers, and all mechanical equipment rooms during construction. Rooms and equipment contained therein must be swept vacuum cleaned at regular intervals. All relays, meters and HVAC equipment containing electrical components must be protected with heavy paper held in place with approved mastic tape to exclude fine dust and particles. Install and maintain sufficient electric heaters in equipment rooms and transformer compartments to keep equipment dry during construction.

3.3 CUTTING AND PATCHING

- A. For existing construction:
 - 1. The General Construction Trade Contractor, where applicable, will perform all cutting and patching required for the work of all trades.

3.4 CONCRETE AND MASONRY

- A. Provide all cast-in-place concrete, pre-cast concrete and masonry work (brick and block) required for completion of the HVAC work, including interior and exterior concrete slabs.
- B. Design Professional will review and approve materials used.
- C. Unless shown or specified otherwise, all equipment foundations and housekeeping pads must be six inches (6") minimum height from floor, of sufficient mass, and secured to the floor.
- D. Refer to the general construction contract documents for concrete specifications.
- E. Unless noted otherwise, concrete bases must be 4" larger than the largest dimension of the base of the supported equipment in both directions. Use 3000 psi, 28 day compressive strength concrete and reinforcement.

3.5 SUPPORTS

- A. Except where noted otherwise in the specifications and shown on drawings, provide all materials, including, but not limited to, equipment supports, supplies and labor necessary as required to adequately support, brace and strengthen new and/or existing equipment and materials installed under/or affected by the HVAC work.
- B. The design, materials, fabrication and erection of structural steel supports must conform to "Specification for Design, Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction, "Code of Standard Practice for Steel Buildings

and Bridges". Welding, where required, must conform to "Code of Arc and Gas Welding in Building Construction" of the American Welding Society.

3.6 LINTELS

- A. Lintel work to be performed in strict accordance with the general construction contract documents. Refer to the general construction contract documents for lintel schedules and details.
- B. Where lintels are not indicated as being provided by General Construction or, the HVAC Trade Contractor must provide lintels required for the installation and completion of HVAC work.

3.7 ESCUTCHEONS

- A. Except as noted otherwise, provide heavy solid pattern, steel, cast iron or malleable iron escutcheons with set screws and prime coat of paint on all uninsulated piping and conduit exposed to view within structure where passing through floors, partitions, walls or ceilings. Escutcheons are not required in equipment rooms, boiler rooms or other unfinished areas.
- B. For piping with sleeves extending above floor, provide escutcheons with deep recesses.
- C. Provide solid pattern, smooth chrome plated cast brass escutcheons for all chrome plated pipe fixture connections.
- D. Provide nickel plated cast iron escutcheons where pipes pass through toilet rooms, walls or ceilings.
- E. Provide collars of angle fabrication for duct passing through floors, walls and ceilings in finished areas.

3.8 MACHINERY GUARDS

- A. Provide OSHA approved expanded sheet steel metal guards over all belt drives, couplings and other moving equipment to protect personnel from injury.
- B. Machinery guards shall comply with OSHA Standards 29 CFR STANDARD NUMBER 1910.212 General Requirements for all Machines; Subpart Number 0; Subtitle - Machinery and Machine Guarding; STANDARD NUMBER 1910.219; Standard Title - Mechanical Power - Transmission Apparatus; Subpart Number 0; Subpart Title - Machinery and Machine Guarding.

3.9 ROOFING WORK

- A. Existing roofing and flashing is under Manufacturer's and Installer's Warranties. All roofing and flashing work shall be performed by warranted roofing installer. Contact Owner or original installer for further information. New penetrations through the roof shall be in full

warranty condition. If required by the roof warranty, engage the original roofing installer to perform all roofing and flashing work. Refer to the general construction contract documents of these specifications.

3.10 PAINTING AND FINISHING

- A. All painting, generally, will be provided by the General Construction Trade Contractor, where applicable, except where specifically noted otherwise in the HVAC Specifications. Otherwise, each Trade Contractor is responsible for his own painting and finishing.
- B. Equipment and material furnished with factory enamel finish will not be painted unless finish has been damaged, in which case the equipment or material must be refinished by the Trade Contractor who furnished it, to the satisfaction of the Design Professional.

3.11 LUBRICATION

- A. Provide proper and necessary lubrication of any items of operating, rotating or moving equipment which is furnished, installed or which must operate as part of the HVAC system.
- B. When an item of operating equipment is furnished and installed by a Trade Contractor, it will be his responsibility to accomplish the lubrication.
- C. When an item of operating equipment is furnished by one Trade Contractor and installed by another, it is the responsibility of the Trade Contractor furnishing the equipment to apply the lubricants.
- D. All rotating or moving equipment must be lubricated prior to energizing and operating the equipment. Should the Trade Contractor responsible for the lubrication fail to apply lubricants prior to initial start-up and the equipment is damaged as a result of his negligence, that Trade Contractor is required to provide all corrective action necessary including replacement, if required, for the proper operation of equipment.
- E. Lubrication must be accomplished in the manner prescribed or recommended by the manufacturer of the specific item. For motor driven equipment this precaution of lubrication will apply individually to the driver and the driven.
- F. The lubricants must be of the type, grade, specification and manufacture as prescribed or recommended by the manufacturer of the specific equipment item.
- G. Extend lubrication fittings where required to allow maintenance personnel to lubricate the equipment easily and efficiently.
- H. The Trade Contractor who supplies any item of rotating equipment will have the responsibility of securing written instructions on the lubricating procedure and must furnish not less than one year's supply of all necessary lubricants properly identified so they can be replaced.

- I. Any moving or rotating equipment furnished by the Owner that is to be installed, reused and/or serviced must also be lubricated. Except where noted otherwise in the Contract Documents, the Trade Contractor installing, reusing and/or servicing all such equipment is responsible for the proper lubrication thereof, including obtaining proper lubricating instructions from the various manufacturers involved, furnishing and applying the necessary lubricants and leaving the Owner with a one (1) year supply of lubricant.

3.12 HVAC TRADE - ELECTRICAL TRADE COORDINATION

- A. Furnish equipment with electrical current characteristics as shown on electrical drawings and specifications.
- B. The nameplate voltage of all motors furnished with mechanical equipment must be within the range of the voltage shown for use with the motor as the upper limit, and 5% less than this voltage as the lower limit.
- C. HVAC Trade Contractor must furnish all motors, motor starters, specialty motor controllers, float and pressure switches, temperature control, other special automatic controls as indicated in the Contract Documents for all equipment furnished and/or installed under the HVAC contract except where noted otherwise.
- D. All electrical equipment furnished by the HVAC Trade Contractor must be as recommended by the equipment manufacturers, in accordance with the Electrical Specifications for similar items, and of such type as to work properly with automatic temperature control sequences where required.
- E. The Electrical Trade Contractor will provide all push-buttons, safety switches for motors, and wiring from starters to motors and install all starters furnished to him by the HVAC Trade Contractor unless otherwise indicated in the Contract Documents.
- F. Where controllers and/or starters are furnished as an integral part of any equipment, the Trade Contractor supplying the equipment must furnish complete wiring between controllers, starters and motors.
- G. The Electrical Trade Contractor must provide disconnect switches for all equipment furnished and/or installed by other Trade Contractors, except where such switches are an integral part of equipment.
- H. HVAC Trade Contractor must set all motors and furnish, set and pipe as necessary, float switches, temperature control and other special automatic temperature controls.
- I. HVAC Trade Contractor must provide all power and control wiring required by his respective section of the specification. The Electrical Trade Contractor will provide all other wiring required for the completion of the work of the HVAC Trade Contractor.
- J. HVAC Trade Contractor must furnish the Electrical Trade Contractor with complete wiring diagrams as required.
- K. Any electrical work performed by the HVAC Trade Contractor must be performed in accordance with the requirements of the ELECTRICAL Section of these specifications.

- L. For additional coordination items, refer to Article 2.2, "Submittals".

3.13 ELECTRICAL MOTORS AND STARTERS

- A. All motors furnished by all Trade Contractors, unless specified to the contrary in Contract Documents, must conform to the following requirements:
 - 1. Characteristics, dimensions, tolerances, temperature rise, insulation, rating, noise, vibration, and all other characteristics in accordance with the latest standards of IEEE or NEMA.
 - 2. Unless required by the driven unit, motors must have normal starting torque, NEMA Design B characteristics. Horsepower rating of motor must be equal to or greater than that required by driven equipment. Current density design of motor rating must be limited so that overload protection provided by standard motor starters will be adequate to prevent damaging overheating during stall, single phasing or slightly prolonged acceleration.
 - 3. Use NEMA Class A or B insulation with motor frames amply sized to provide a 1.15 service factor at an ambient of 40 deg. C maximum. Insulation systems must be designed for an average life of 60,000 hours.
 - 4. All motors must be high efficiency. Meet or exceed requirements in NEMA Standard MG1, Table 12-10.
 - 5. Running power factor must be higher than 0.85 for motors 5 HP to 30 HP.
 - 6. Each motor must be mounted on the same bedplate as the equipment driven and be complete with pulleys, slide rails or flexible couplings as required.
 - 7. Each Trade Contractor is responsible in each instance for the proper selection of motors of suitable characteristics with details submitted for approval to the Design Professional prior to installation.

- B. All starters furnished by all Trade Contractors must conform with the following requirements, unless specified to the contrary in the Contract Documents:
 - 1. All starters for 3-phase equipment must be fully enclosed, across-the-line type equipped with solid state overload protection as herein specified for all three phases, low voltage protection, all necessary auxiliary contacts as required and indicating pilot lights. Starters which are controlled automatically must have two-wire control with "ON-OFF-AUTO" switches. Starters which are controlled manually must have 3-wire control with Start-Stop pushbuttons.
 - 2. All 3-phase starters remotely controlled must have 120 volt coils and control transformers with disconnecting means. Starters for single phase motors shall be manual toggle switches with thermal overload protection and pilot light. Omit pilot light for unit heaters.
 - 3. General Purpose NEMA-1 enclosure for indoor use under normal atmospheric conditions. Watertight enclosure NEMA-4 or NEMA-5 for outdoor use or where starters are subjected to the splashing or dripping of water. Explosion-proof enclosure NEMA-7, 9 or 12 for dusty or hazardous locations as required by Article 500 of the National Electrical Code.
 - 4. Individually equip all starters for three phase motors with solid state adjustable overload protection with automatic protection to prevent single phase operation with the following features:

- a. Three phase, self-powered with current sensing, phase unbalance and phase loss protection, visible trip indication, trip test function, and power "LED."
 - b. Phase loss protection to include automatic restart with a selectable manual switch.
- C. All controllers, starters and other electrical components furnished as an integral part of any apparatus must be furnished complete with integral wiring as required.
- D. So far as is practical, all motors and starters must be of one manufacturer.
- E. Subject to compliance with the requirements, provide products by one of the following:
 - 1. General Electric Co.;
 - 2. Westinghouse Co.;
 - 3. Square-D Co.;
 - 4. Allen-Bradley Co.
 - 5. Or approved equal in accordance with the project substitution provisions of the contract.
- F. Submittals for motors and starters must be coordinated with Electrical Trade Contractor.

3.14 ELECTRICAL PROVISIONS FOR PACKAGED HVAC EQUIPMENT

- A. Unless otherwise noted in HVAC Specifications, all packaged equipment furnished by HVAC Trade Contractor must be complete with the following electrical provisions:
 - 1. General compliance with provisions of the preceding Article, ELECTRICAL MOTORS AND STARTERS.
 - 2. Starting electrical characteristics of all motors and/or starters must be approved by local utility company and Design Professional.
- B. Approved, factory installed and wired starting, operating and control equipment, terminating in terminal strip for single point power wiring connections by Electrical Trade Contractor must conform with the ELECTRICAL Section of these specifications and must include approved branch fuses for branch power circuits.

3.15 PIPING AND EQUIPMENT IDENTIFICATION

- A. Subject to compliance with the requirements, provide products by one of the following:
 - 1. Seton Nameplate Corporation;
 - 2. Marking Services, Inc.;
 - 3. Brady Worldwide.
 - 4. Or approved equal in accordance with the project substitution provisions of the contract.
- B. Pipe markers must comply with OSHA Standards. Wording and color coding must conform to the current edition of ANSI/ASME A13.1.

- C. Mark all systems of piping with markers 12 foot maximum centers.
- D. Markers must indicate the following:
 - 1. Pipe contents in legend form.
 - 2. Size of piping.
 - 3. Direction of flow in piping.
- E. Identify all valves, controls, dampers and other parts of HVAC systems by means of 2" round brass, aluminum or plastic tags. Tags must have engraved or stamped letters or numbers 1/2" high. Fasten tags securely with brass "S" hooks or chains.
- F. Provide 1/2" scale diagrams showing location, number and service or function of each tagged item. Frame diagrams in approved frame with clear Lucite front, secured to walls in location as directed by Owner. Provide two (2) separate copies of each diagram, permanently framed and covered as two (2) separate items.
- G. Identify all equipment as to nature, service and purpose by means of permanently attached plastic nameplates having 1/2" high letters, dull black outside and white core. Nameplates of approved size, beveled edges and engraved through black to white core. Nameplates shall indicate equipment identification names and numbers as approved by the Owner.

3.16 ABANDONMENT, REMOVAL AND RELOCATION

- A. Perform all abandonment, removal and relocation work required for completion of HVAC systems.
- B. Removals shown on drawings are a general indication only, and may not necessarily indicate the full extent of removals which may be required to complete this work.
- C. Where existing partitions, walls, ceilings and floors are to be removed, all ducts, piping, conduits, materials and equipment attached or fastened thereto or within, as applicable, must be carefully removed.
- D. Where work under this contract interferes with the existing construction, ductwork, piping, conduit or equipment, remove all such materials and route new work to clear the obstruction. Provide additional piping, conduits, ducts, and material of the same design and quality if the piping and/or conduit is to be continued in use.
- E. Disconnect and remove all accessible piping, conduit, ductwork, materials, fixtures and equipment not required in the new systems. Plug all outlets at the main or riser connection.
- F. Removed materials not desired by the Owner and not to be reset and not specified nor indicated to be reused, become the property of the HVAC Trade Contractor and must be promptly removed from site.

- G. All demolition work is subject to the direction and approval of the Design Professional and must be performed in such manner as not to interfere with the normal operation of the building.
- H. Relocate existing utilities and/or equipment that must remain to maintain operation of building or parts of building outside the work area.

3.17 SMOKE AND FIRESTOPPING (METHODS)

- A. Installation of materials must be performed by applicator/installers qualified, trained and approved by the manufacturer of the materials, and be installed in accordance with ASTM E 814.
- B. Install smoke and firestopping at locations required, shown, or specified in accordance with applicable codes, manufacturer's written instructions, and test report, applying to the specific trade equipment as applicable. Cutting and patching of construction and providing sleeves, where required, is shown on drawings or specified in other sections.
 - 1. Filling of Voids: Smoke and firestopping materials must completely fill void spaces regardless of geometric configuration, subject to tolerances established by the manufacturer. Smoke and firestopping for filling voids in floors in which the smallest dimension of the void is 4 in. or more must support the same load as the floor is designed to support or must be protected by a permanent barrier to prevent loading or traffic in the smoke or firestopped areas.
 - 2. Insulated Ductwork and Pipes: Insulated equipment penetrating rated floors and walls must be insulated with materials which provide the same performance as the smoke and firestopping material. This material must extend a minimum of 6 in. on each side of the opening. Vapor barrier of such insulation must have a perm rating of 0.03 maximum.
 - 3. Electrical Cables or Conduits: Smoke and firestopping at penetrations of electrical cables or conduits must comply with the requirements of NFPA No. 70.
 - 4. Where smoke and firestopping of penetrations in floors, walls and partitions that will be exposed in completed construction, provide protection as necessary to prevent damage to adjacent surfaces and finishes, and provide escutcheons or other trim.
 - 5. Schedule the installation and required inspection of smoke and firestops for penetrations that will be concealed in completed construction prior to erection of floors, walls, and partitions that would permanently conceal the penetrations.
- C. All areas of smoke and firestopping installation must be accessible until inspection by the applicable code authorities.

3.18 SUBSURFACE CONCEALED UNKNOWN PHYSICAL CONDITIONS

- A. Subsurface, or otherwise concealed physical conditions which (1) do not differ materially from those indicated in the Project Contract Documents; (2) affect HVAC work; (3) do not differ materially from those ordinarily found to exist, and which are generally recognized as inherent in HVAC construction activities of the character provided for in the Project

Contract Documents, are to be anticipated by the HVAC Trade Contractor, and included in the basic HVAC work.

- B. Unknown physical conditions: which are of an unusual nature; which are materially different in subsurface (otherwise concealed) physical conditions; which affect the HVAC work; which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character found in the Project Contract Documents, are the basis for and require notice by the applicable building trade, promptly, before such conditions are disturbed. Such conditions may become the basis for a legitimate claim under "Changed Conditions," affecting the cost, and/or schedule of the work. During the work, the HVAC Trade Contractor shall provide reasonable, incidental on-site review, survey and measurements to assist in quantification of such conditions.

3.19 TEMPORARY PARTITIONS

- A. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas. Refer to Division 01 of these specifications.

3.20 INITIAL APPLICATION FOR PAYMENT

- A. Provide the following prior to the initial application for payment:
 - 1. Copy of the HVAC Trade Contractor's and Sub-Contractors' license for the state in which the work is being performed.
 - 2. Resumes for the designated Project Manager and Project Foreman.
 - 3. Resume for the Sheet Metal Sketcher. This resume must be provide in advance of the initiation of preparation of sheet metal shop drawings.
 - 4. List of independent agencies who will be engaged by the HVAC Trade Contractor to perform tests, provide certifications, conduct inspections, etc. as required by Contract Documents.
- B. The initial application for payment will not be processed until the items above are submitted.
- C. Include line items for:
 - 1. TAB report.
 - 2. Coordination Drawings
 - 3. Provide breakouts for work at multiple buildings, floors and/or areas of building.

3.21 FINAL APPLICATION FOR PAYMENT

- A. Provide the following prior to the final application for payment:
 - 1. Refer to the general construction contract documents of these specifications.
 - 2. Pipe Pressure Test Reports.
 - 3. Equipment Start-Up Reports for each piece of HVAC equipment.
 - 4. Operation and Maintenance Manuals and Data.

5. Testing, Adjusting and Balancing Report for HVAC systems.
6. HVAC system and equipment warranties.
7. HVAC Contractor's Punch List of incomplete work items with reason why each work item is not complete and anticipated schedule for completion. Submit at least one week prior to Engineer's final Construction Observation Report site visit.
8. HVAC Trade Contractor's notarized certification letter.
9. As-built drawings as described in Part 1 of this specification section.

B. Final payment is contingent upon completion of all items listed above.

3.22 ADDITIONAL HVAC TRADE CONTRACTOR PAID FEES AND EXPENSES

A. As a material part of the HVAC Trade Contractor's Agreement to complete the work of this Contract, the HVAC Trade Contractor agrees to reimburse Gillan & Hartmann, Inc. ("Design Professional") for the below listed extra engineering work under the following conditions:

1. Design Professional's hourly billing rate shall be \$250.00 per hour for all related office hours, travel time and as applicable, on-site time;
2. HVAC Trade Contractor's request(s) for substitution;
 - a. When such requests for substitution are not the result of a bonafide delivery problem or design related problem, and;
 - b. When such requests do not address items of equipment for which the specifications list the basis of design with at least one comparable product, and;
 - c. The HVAC Trade Contractor's request(s) for substitution must be submitted in writing, and;
 - d. The HVAC Trade Contractor agrees to compensate the Design Professional \$1,500.00 for the review of each proposed substitution;
 - e. The HVAC Trade Contractor shall render written acceptance of the Design Professional's extra charges, and;
 - f. Any balance not paid will be deducted from contractors' final payment.
3. Extra Design Professional work created by the HVAC Trade Contractor's multiple submissions of a single material or piece of equipment;
 - a. The Design Professional's basic services include two reviews for each piece of equipment or material submittal. The Design Professional's first review takes place at the initial HVAC Trade Contractor's submission of that submittal. The Design Professional's second review takes place when the Design Professional requires a resubmission of that submittal.
 - b. If the Design Professional's third review of a particular submittal is required for reasons due to the HVAC Trade Contractor, the Trade Contractor agrees to compensate the Design Professional \$1,500.00 for each submittal review.
 - c. Any unpaid balance due will be deducted from the Trade Contractors final payment.

4. Extra work created by the HVAC Trade Contractor resolution of substantial completion and final completion construction observation reports and project closeout documentation:
 - a. The Design Professional's basic services rendered to the Owner include periodic visits to the site and providing written list of items (Construction Observation Report) requiring the HVAC Trade Contractor's attention, reporting and resolution;
 - b. The HVAC Trade Contractor shall provide written feedback and prompt resolution of Construction Observation Items including a written schedule for the HVAC Trade Contractor's completion of these Items followed by a written confirmation of closure;
 - c. The contract documents specify the HVAC Trade Contractor's requirements including written notification of substantial completion, including contractor's prepared punch list of items to be completed;
 - d. The Design Professional services include: the preparation of one (1) substantial completion/final completion observation report; and one (1) review of the HVAC Trade Contractor's resolution of the substantial completion/final completion observation report.
 - e. The HVAC Trade Contractor agrees to compensate the Design Professional \$1,500.00 (per diem) for the preparation of additional substantial completion/final completion reports as required to achieve final completion.
 - f. Any unpaid balance will be deducted from the contractor's final payment.

Date: 5/25/2016

GILLAN HARTMANN, INC. REQUEST FOR PROFESSIONAL'S REVIEW/COMMENT
 140 Whitaker Avenue, Mont Clare, PA 19453 PROPOSED MANUFACTURERS SUB-CONTRACTORS LIST

Project No.: _____
 Contract No.: _____
 Project Title: _____
 Location: _____
 Contractor's Authorized Staff Signature: _____
 Print Name: _____

1.) LIST OF ABBREVIATORS (ABB): **MFR:** MANUFACTURER **SUB:** SUBCONTRACTOR **SUBST:** SUBSTITUTION
TEST: TESTING AGENCY **WELD:** WELDER **CERT:** CERTIFICATION
FAB: FABRICATOR **SUP:** SUPPLIER

- 2.) SIGNIFY BY **X**, IF PRODUCT IS BASIS OF DESIGN, AS DEFINED IN THE CONTRACT DOCUMENTS;
- 3.) SIGNIFY BY **X**, IF PRODUCT A LISTED MANUFACTURER (VARIATION), AS DEFINED IN THE CONTRACT DOCUMENTS; LIST MANUFACTURER
- 4.) SIGNIFY BY **X**, IF PRODUCT IS A COMPARABLE PRODUCT; I.E. NON-LISTED IN THE CONTRACT DOCUMENTS (SUBSTITUTION), AS DEFINED IN THE CONTRACT DOCUMENTS; CERTIFICATION OF COMPARABLE PRODUCT FROM MANUFACTURER MUST BE ATTACHED. INCLUDE ASSOCIATED DOCUMENTATION REQUIRED BY THE CONTRACT DOCUMENTS.
- 5.) SIGNIFY BY **Y** OR **N**, IF PROPOSED SUBCONTRACTOR IS AN INDEPENDENT AGENT WITH NO CONFLICT OF INTEREST WITH CONTRACTOR.

CONTRACTOR NAME AND ADDRESS:

Material or Work; Indicate associated Specifications Section/Para.	ABB (1)	Basis of Design (2)	Listed Manufacturer Variation (3)	Comparable Product Substitution (4)	Name & Address	Relation to Contractor Y or N(5)	ADDITIONAL SUBMITTAL INFORMATION REQUESTED BY PROFESSIONAL BASED ON INITIAL SUBMISSIONS					
							Sample	Shop Draw	Subst. Info	Name Requested	Proceed Submittal	REU
EXAMPLE: Hydraulic Piping - Section 1510; 2.2	SUP	X			117 PIPING, 1234 MAIN ST, SMALL TOWN, US XXXXX	N		X				

REVIEWED:

SIGNATURE OF PROFESSIONAL

PROJECT NAME: **Grillan Hartmann, Inc.**
HVAC SHOP DRAWING LOG

JOB NO.:
 DATE: 5/25/2016

ITEM NO.	PROPOSED SUBMITTAL DATE	DATE REC'D	MFR. OR CONTRACTOR	DESCRIPTION	Action	Date Return	Re-submit	Distrib.	Sent to Elec.	Checked by
H-01										
H-02										
H-03										
H-04										
H-05										
H-06										
H-07										
H-08										
H-09										
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H-20										
H-21										
H-22										

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 Status: Pending (P); Furnish as Submitted (FAS); Furnish As Noted (FAN); Rejected (REJ); No Submission Required (NSR)

Contractor's Submittal Description: _____, Project _____
(Fill In) (Fill In)

HVAC CONTRACTOR'S TRANSMITTAL COVER SHEET

TO: GILLAN & HARTMANN, INC.
CONSULTING ENGINEERS
P.O. BOX 345
VALLEY FORGE, PENNSYLVANIA 19481

Date of Transmittal: _____	By Contractor: _____ Contractor's Authorized Staff Signature: _____ Print Name: _____ Project: _____
----------------------------	---

By executing this Transmittal Cover, the Contractor agrees and accepts that:

- Submittals without the HVAC and Electrical Contractor's signed stamp of approval will not be reviewed. Initialed approval stamps are not acceptable. All resulting resubmittals will be provided at the Contractor's expense.
- The Engineer's recommendation of acceptance ("Furnish as Submitted", "Furnish as Noted Below", etc.) of the equipment proposed by the Contractor is conditional upon the Contractor fulfilling all obligations of the Contract Documents. By furnishing the proposed equipment, the Contractor acknowledges compliance with all of the following:
 - The Contractor has completed field layout and planning of proposed equipment and has coordinated all other related shop drawings, related trades involved in Project Construction, and all space requirements.
 - The Contractor has examined all shop drawings prior to submission. The Contractor forwards all shop drawings with a signed approved stamp, signifying the following:
 - 1) All field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data have been verified.
 - 2) The Architect/Engineer has been notified of all site conditions which affect the work, and which require design resolution beyond resolution by Trade contractors' Field Decisions;
 - 3) All items herein are approved by the Contractor, and have been coordinated and checked with other applicable submittals, and contract requirements;
 - 4) Submission is clearly marked to indicate which manufacturer's options are provided and which are not provided with the proposed equipment.
 - Any and all exceptions requested by the HVAC and Electrical Contractors have been included in written form. All exceptions, deletions, and additions that vary from the Contract Documents have been specifically annotated and initialed. Failing to provide the initialed annotations for all deletions and additions, the Contractor accepts the condition that the Contract Documents will govern, and will be used to resolve disputes.
 - All Engineer's notes regarding this submission must be incorporated into the Project.
 - The Engineer's review is limited to comparison of the technical performance of the Contractor's proposed equipment to the specified technical performance.
 - Equipment submittal is either the Basis-of-Design, or a comparable product to the Basis-of-Design.
 - A Comparable Product must meet or exceed all the salient characteristics and standards necessary including, but not limited to: material of manufacture; independent testing agency certifications; quality; function; design; and performance required to meet the Owner's needs and meet the objectives of the Professional's Project Design.
 - Extension of Contract Time and/or claim for delay are not acceptable as created by the Trade Contractor's failure to provide submittals on a timely basis to permit the processing work of the Professional, including multiple resubmittals, and/or failure to provide submittals that are comparable to the Basis of Design Product. Refer to EQUIPMENT VARIATIONS AND SUBSTITUTIONS article in the General Requirements Section of the Specifications.

G&H Project No: _____

G&H Shop Drawing Review No: _____ H-_____

Contractor's Submittal Description: _____, Project _____
(Fill In) (Fill In)

**HVAC AND ELECTRICAL TRADES'
COORDINATION OF HVAC EQUIPMENT
ELECTRICAL REQUIREMENTS
TRANSMITTAL COVER SHEET**

TO: GILLAN & HARTMANN, INC.
CONSULTING ENGINEERS
P.O. BOX 345
VALLEY FORGE, PENNSYLVANIA 19481

By HVAC Trade Rep: _____
Contractor's Authorized Staff Signature: _____
Print Name: _____
Date of Transmittal: _____

By Electrical Trade Rep: _____
Contractor's Authorized Staff Signature: _____
Print Name: _____
Date of Transmittal: _____

By executing this Transmittal Cover, the Contractor agrees and accepts that:

1. Submittals without the HVAC and Electrical Trades' signed stamp of approval will not be reviewed. Initialed approval stamps are not acceptable. All resulting resubmittals will be provided at the Contractor's expense.
2. The HVAC Trade Representative has submitted the attached HVAC Equipment Submittal to the Electrical Trade Representative for examination, review, and coordination of the attached HVAC Equipment Electrical Requirements. The equipment proposed by the Contractor is conditional upon the Contractor fulfilling all obligations of the Contract Documents. By furnishing the proposed equipment, the Contractor acknowledges compliance with all of the following:
 - A. The Contractor has completed field layout and planning of proposed equipment and has coordinated all other related submittals, related Trades involved in Project Construction, and all space requirements.
 - B. The HVAC and Electrical Trades have examined all submittals prior to submission. The HVAC and Electrical Trades forwards all submittals with a signed transmittal stamp, signifying the following:
 - 1) All field measurements, field construction criteria, electrical power requirements and similar data have been verified;
 - 2) The Architect/Engineer has been notified of all site conditions which affect the work, and which require design resolution beyond resolution by Trade contractors' Field Decisions;
 - 3) All items herein are approved by the Contractor, and have been coordinated and checked with other applicable submittals, and contract requirements;
 - 4) Submission is clearly marked to indicate which manufacturer's options are provided and which are not provided with the proposed equipment.
 - C. Any and all exceptions requested by the HVAC and Electrical Trades have been included in written form. All exceptions, deletions, and additions that vary from the Contract Documents have been specifically annotated and initialed. Failing to provide the initialed annotations for all deletions and additions, the Contractor accepts the condition that the Contract Documents will govern, and will be used to resolve disputes.

G&H Project No: _____

G&H Shop Drawing Review No: _____

END OF SECTION 230010

SECTION 230553 - IDENTIFICATION FOR HVAC AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Duct labels.
 - 3. Stencils.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Equipment-Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. The product shall be as manufactured by one of the following:
 - a. Seton Identification Product
 - b. Brimar Industries
 - c. Brady Corporation
 - 2. Material and Thickness: Brass, 0.032-inch minimum thickness, with predrilled or stamped holes for attachment hardware.
 - 3. Letter and Background Color: As indicated for specific application under Part 3.
 - 4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch .
 - 5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of 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.
 - 6. Fasteners: Stainless steel rivets or self-tapping screws.
 - 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. The product shall be as manufactured by one of the following:
 - a. Seton Identification Product
 - b. Brimar Industries
 - c. Brady Corporation
2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.
3. Letter and Background Color: As indicated for specific application under Part 3.
4. Maximum Temperature: Able to withstand temperatures of up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of 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.
7. Fasteners: Stainless steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

2.2 DUCT LABELS

A. The product shall be as manufactured by one of the following:

1. Seton Identification Product
2. Brimar Industries
3. Brady Corporation

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless steel rivets or self-tapping screws.

- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings. Also include the following:
 - 1. Duct size.
 - 2. Flow-Direction Arrows: Include flow-direction arrows on main distribution ducts. Arrows may be either integral with label or may be applied separately.
 - 3. Lettering Size: Size letters in accordance with ASME A13.1 for piping. At least 1/2 inch for viewing distances of up to 72 inches and proportionately larger lettering for greater viewing distances.
 - 4. Label ductwork: "Supply Air" or "Exhaust Air" along with direction of flow arrows.

2.3 STENCILS

- A. Stencils for ducts:
 - 1. The products shall be as manufactured by one of the following:
 - a. Brimar Industries
 - b. Craftmark Pipe Markers
 - c. Marking Serves Inc.
 - 2. Lettering Size: Size letters in accordance with ASME A13.1 for piping. At least 1/2 inch for viewing distances of up to 72 inches and proportionately larger lettering for greater viewing distances.
 - 3. Stencil Material: Aluminum, brass, or fiberboard.
 - 4. Stencil Paint: Exterior, gloss, alkyd enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
 - 5. Identification Paint: Exterior, alkyd enamel. Paint may be in pressurized spray-can form.
 - 6. Letter and Background Color: As indicated for specific application under Part 3.
- B. Stencils for Access Panels and Door Labels, Equipment Labels, and Similar Operational Instructions:
 - 1. The products shall be as manufactured by one of the following:
 - a. Brimar Industries
 - b. Craftmark Pipe Markers
 - c. Marking Serves Inc.
 - 2. Lettering Size: Minimum letter height of 1/2 inch for viewing distances of up to 72 inches and proportionately larger lettering for greater viewing distances.
 - 3. Stencil Material: Brass.
 - 4. Stencil Paint: Exterior, gloss, alkyd enamel. Paint may be in pressurized spray-can form.
 - 5. Identification Paint: Exterior, alkyd enamel. Paint may be in pressurized spray-can form.

6. Letter and Background Color: As indicated for specific application under Part 3.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION, GENERAL REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.
- D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF EQUIPMENT LABELS, WARNING SIGNS, AND LABELS

- A. Permanently fasten labels on each item of mechanical equipment.
- B. Sign and Label Colors:
 1. White letters on an ANSI Z535.1 safety-blue background.
- C. Locate equipment labels where accessible and visible.

3.4 INSTALLATION OF DUCT LABELS

- A. Install plastic-laminated or self-adhesive duct labels showing service and flow direction with permanent adhesive on air ducts.
 1. Provide labels in the following color codes:
 - a. For air supply ducts: White letters on blue background.
 - b. For air return ducts: White letters on blue background.
 - c. For exhaust-, outside-, relief-, return-, and mixed-air ducts: White letters on blue background.
- B. Locate label near each point where ducts enter into and exit from concealed spaces and at maximum intervals of 20 ft. where exposed or are concealed by removable ceiling system.

C. Stenciled Access Panels and Door Labels, Equipment Labels, and Similar Operational Instructions:

1. Black letters on White background.

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. Testing, Adjusting, and Balancing of Air Systems:
 - a. Constant-volume air systems.
 - 2. Testing, Adjusting, and Balancing of Hydronic Piping Systems:
 - a. Constant-flow hydronic systems.
 - 3. Testing, adjusting, and balancing of equipment.
 - 4. Duct leakage tests verification.
 - 5. Pipe leakage tests verification.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- F. TDH: Total dynamic head.
- G. UFAD: Underfloor air distribution.

1.4 INFORMATIONAL SUBMITTALS

- A. Certified TAB reports.

- B. Sample report forms.
- C. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.

1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications, Certified by NEBB or TABB:
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
 - 2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."
- D. Code and AHJ Compliance: TAB is required to comply with governing codes and requirements of authorities having jurisdiction.

1.6 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify

that locations of these balancing devices are applicable for intended purpose and are accessible.

- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums used for HVAC to verify that they are properly separated from adjacent areas and sealed.
- F. Examine equipment performance data, including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine temporary and permanent strainers. Verify that temporary strainer screens used during system cleaning and flushing have been removed and permanent strainer baskets are installed and clean.
- K. Examine control valves for proper installation for their intended function of isolating, throttling, diverting, or mixing fluid flows.
- L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- M. Examine system pumps to ensure absence of entrained air in the suction piping.
- N. Examine operating safety interlocks and controls on HVAC equipment.
- O. Examine control dampers for proper installation for their intended function of isolating, throttling, diverting, or mixing air flows.

- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.

- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Where applicable; Volume, smoke, and fire dampers are open and functional.
 - d. Clean filters are installed.
 - e. Fans are operating, free of vibration, and rotating in correct direction.
 - f. Variable-frequency controllers' startup is complete and safeties are verified.
 - g. Automatic temperature-control systems are operational.
 - h. Ceilings are installed.
 - i. Windows and doors are installed.
 - j. Suitable access to balancing devices and equipment is provided.

 - 2. Hydronics:
 - a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
 - b. Piping is complete with terminals installed.
 - c. Water treatment is complete.
 - d. Systems are flushed, filled, and air purged.
 - e. Strainers are pulled and cleaned.
 - f. Control valves are functioning in accordance with the sequence of operation.
 - g. Shutoff and balance valves have been verified to be 100 percent open.
 - h. Pumps are started and proper rotation is verified.
 - i. Pump gauge connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
 - j. Variable-frequency controllers' startup is complete and safeties are verified.
 - k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system in accordance with the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment casings for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. Where holes for probes are required in piping or hydronic equipment, install pressure and temperature test plugs to seal systems.
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 TESTING, ADJUSTING, AND BALANCING OF HVAC EQUIPMENT

- A. Test, adjust, and balance HVAC equipment indicated on Drawings, including, but not limited to, the following:
 - 1. Motors.
 - 2. Pumps.
 - 3. Fans and ventilators.
 - 4. Rooftop air-conditioning units.
 - 5. Dedicated outdoor-air units.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' Record drawings duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. 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 main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses close to the fan and prior to any outlets, to obtain total airflow.
 - c. Where duct conditions are unsuitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 - 3. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 - 4. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
 - 1. Measure airflow of submain and branch ducts.

2. Adjust submain and branch duct volume dampers for specified airflow.
 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure inlets and outlets airflow.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 2. Re-measure and confirm that total airflow is within design.
 3. Re-measure all final fan operating data, speed, volts, amps, and static profile.
 4. Mark all final settings.
 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 6. Measure and record all operating data.
 7. Record final fan-performance data.

3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils, and other equipment. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and equipment flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' Record drawings piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
1. Check highest vent for adequate pressure.
 2. Check flow-control valves for proper position.
 3. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
 4. Verify that motor controllers are equipped with properly sized thermal protection.
 5. Check that air has been purged from the system.
- D. Measure and record upstream and downstream pressure of each piece of equipment.
- E. Measure and record upstream and downstream pressure of pressure-reducing valves.
- F. Check settings and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record final settings.
1. Check settings and operation of each safety valve. Record settings.

3.8 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

- A. Balance systems with automatic two- or three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.
- B. Adjust the variable-flow hydronic system as follows:
 - 1. Verify that the pressure-differential sensor(s) is located as indicated.
 - 2. Determine whether there is diversity in the system.
- C. For systems with no flow diversity:
 - 1. Adjust pumps to deliver total design flow.
 - a. Measure total water flow.
 - 1) Position valves for full flow through coils.
 - 2) Measure flow by main flow meter, if installed.
 - 3) If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.
 - b. Measure pump TDH as follows:
 - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gauge heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve or speed until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.
 - c. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.
 - 2. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
 - 3. Adjust flow-measuring devices installed at terminals for each space to design water flows.

- a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
4. For systems with pressure-independent valves at terminals:
- a. Measure differential pressure and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
5. For systems without pressure-independent valves or flow-measuring devices at terminals:
- a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
6. Prior to verifying final system conditions, determine the system pressure-differential set point(s).
7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion, open discharge valve 100 percent, and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
8. Mark final settings and verify that all memory stops have been set.
9. Verify final system conditions as follows:
- a. Re-measure and confirm that total flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
 - c. Mark final settings.
- D. For systems with flow diversity:
1. Determine diversity factor.
 2. Simulate system diversity by closing required number of control valves, as approved by Architect.
 3. Adjust pumps to deliver total design flow.
 - a. Measure total water flow.
 - 1) Position valves for full flow through coils.
 - 2) Measure flow by main flow meter, if installed.
 - 3) If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.
 - b. Measure pump TDH as follows:

- 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gauge heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve or speed until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.
- c. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.
4. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
 5. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
 6. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure, and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
 7. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
 8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.

9. Prior to verifying final system conditions, determine system pressure-differential set point(s).
10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion, open discharge valve 100 percent, and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
11. Mark final settings and verify that memory stops have been set.
12. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
 - c. Mark final settings.

3.9 DUCT LEAKAGE TESTS

- A. Witness the duct leakage testing performed by Installer.
- B. Verify that proper test methods are used and that leakage rates are within specified limits.
- C. Report deficiencies observed.

3.10 PIPE LEAKAGE TESTS

- A. Witness the pipe pressure testing performed by Installer.
- B. Verify that proper test methods are used and that leakage rates are within specified limits.
- C. Report deficiencies observed.

3.11 HVAC CONTROLS VERIFICATION

- A. In conjunction with system balancing, perform the following:
 1. Verify HVAC control system is operating within the design limitations.
 2. Confirm that the sequences of operation are in compliance with Contract Documents.
 3. Verify that controllers are calibrated and function as intended.
 4. Verify that controller set points are as indicated.
 5. Verify the operation of lockout or interlock systems.
 6. Verify the operation of valve and damper actuators.
 7. Verify that controlled devices are properly installed and connected to correct controller.
 8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
 9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

- B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.12 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

- 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
- 2. Include a list of instruments used for procedures, along with proof of calibration.
- 3. Certify validity and accuracy of field data.

- B. Final Report Contents: In addition to certified field-report data, include the following:

- 1. Pump curves.
- 2. Fan curves.
- 3. Manufacturers' test data.
- 4. Field test reports prepared by system and equipment installers.
- 5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

- C. General Report Data: In addition to form titles and entries, include the following data:

- 1. Title page.
- 2. Name and address of the TAB specialist.
- 3. Project name.
- 4. Project location.
- 5. Architect's name and address.
- 6. Engineer's name and address.
- 7. Contractor's name and address.
- 8. Report date.
- 9. Signature of TAB supervisor who certifies the report.
- 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
- 11. Summary of contents, including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
- 12. Nomenclature sheets for each item of equipment.
- 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
- 14. Notes to explain why certain final data in the body of reports vary from indicated values.
- 15. Test conditions for fans performance forms, including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.

- b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Heating coil, dry-bulb conditions.
 - e. Face and bypass damper settings at coils.
 - f. Fan drive settings, including settings and percentage of maximum pitch diameter.
 - g. Settings for pressure controller(s).
 - h. Other system operating conditions that affect performance.
16. Test conditions for pump performance forms, including the following:
- a. Variable-frequency controller settings for variable-flow hydronic systems.
 - b. Settings for pressure controller(s).
 - c. Other system operating conditions that affect performance.
- D. Air-Handling-Unit Test Reports: For air-handling units, include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and speed.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan speed.
 - d. Inlet and discharge static pressure in inches wg.
 - e. For each filter bank, filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.
 - g. Cooling-coil static-pressure differential in inches wg.
 - h. Heating-coil static-pressure differential in inches wg.

- i. List for each internal component with pressure-drop, static-pressure differential in inches wg.
- j. Outdoor airflow in cfm.
- k. Return airflow in cfm.
- l. Outdoor-air damper position.
- m. Return-air damper position.

E. Apparatus-Coil Test Reports:

1. Coil Data:

- a. System identification.
- b. Location.
- c. Coil type.
- d. Number of rows.
- e. Fin spacing in fins per inch o.c.
- f. Make and model number.
- g. Face area in sq. ft.
- h. Tube size in NPS.
- i. Tube and fin materials.
- j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

- a. Airflow rate in cfm.
- b. Average face velocity in fpm.
- c. Air pressure drop in inches wg.
- d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
- e. Return-air, wet- and dry-bulb temperatures in deg F.
- f. Entering-air, wet- and dry-bulb temperatures in deg F.
- g. Leaving-air, wet- and dry-bulb temperatures in deg F.
- h. Water flow rate in gpm.
- i. Water pressure differential in feet of head or psig.
- j. Entering-water temperature in deg F.
- k. Leaving-water temperature in deg F.
- l. Refrigerant expansion valve and refrigerant types.
- m. Refrigerant suction pressure in psig.
- n. Refrigerant suction temperature in deg F.
- o. Inlet steam pressure in psig.

F. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

- a. System identification.
- b. Location.
- c. Make and type.
- d. Model number and size.
- e. Manufacturer's serial number.

- f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and speed.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 - 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan speed.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- G. Air-Terminal-Device Reports:
 - 1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft..
 - 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary airflow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final airflow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.
- H. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
 - 1. Unit Data:

- a. System and air-handling-unit identification.
 - b. Location and zone.
 - c. Room or riser served.
 - d. Coil make and size.
 - e. Flowmeter type.
2. Test Data (Indicated and Actual Values):
- a. Airflow rate in cfm.
 - b. Entering-water temperature in deg F.
 - c. Leaving-water temperature in deg F.
 - d. Water pressure drop in feet of head or psig.
 - e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.
- I. Instrument Calibration Reports:
1. Report Data:
- a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.13 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Construction Manager or Commissioning Authority.
- B. Construction Manager or Commissioning Authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to the lesser of either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the TAB shall be considered incomplete and shall be rejected.
- E. If recheck measurements find the number of failed measurements noncompliant with requirements indicated, proceed as follows:
 - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and

request a second final inspection. All changes shall be tracked to show changes made to previous report.

2. If the second final inspection also fails, Owner may pursue others Contract options to complete TAB work.

- F. Prepare test and inspection reports.

3.14 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713 - DUCT 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 insulation for duct systems.
- B. Exterior metal ductwork shall be board type insulation.

1.3 DEFINITIONS

- A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.
- B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.
- C. Cold Surfaces: Normal operating temperature less than 75 deg F.
- D. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F.
- E. Density: Is expressed in lb/cu. ft.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.5 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.

1.6 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing 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.

1.7 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.

1.8 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in other Division 23 Sections.
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK

jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Manson Insulation Inc.
 - e. Owens Corning.
 - f. Or approved equal.
2. Performance Characteristics:
 - a. Thermal Conductivity: 0.29 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Manson Insulation Inc.
2. Performance Characteristics:
 - a. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.

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.
 1. Produced under the UL Classification and Follow-up service.
 2. Type: Non-flammable, solvent-based.
 3. Service Temperature Range: Minus 20 to 180 deg F.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

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. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
 2. Service Temperature Range: 0 to plus 180 deg F.
 3. Color: White.

2.5 SEALANTS

- A. 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.
 4. Color: Aluminum.

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. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 2. Performance Characteristics:
 - a. Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E 96.
 - b. Puncture Resistance: 50 beach units minimum, when tested according to ASTM D 781.

2.7 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division.
 - b. Knauf Insulation.
 - c. Venture Tape.
 - d. Or approved equal.
 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.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division.
 - b. Knauf Insulation.
 - c. Venture Tape.
 - d. Or approved equal.
2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.8 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal or closed seal.

B. Insulation Pins and Hangers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless steel.

2.9 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D1784, Class 16354-C. White or color-coded to match adjacent surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

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 ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct 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. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. 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.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- O. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for a minimum of 50 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. 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.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

- b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 - 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 - 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 - 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
 - 8. Location where lined ductwork is connected to wrapped ductwork: Overlap lined sections of ductwork by a minimum of 6" with blanket insulation.
- P. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
- 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. 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.
 - 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c..

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 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.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: 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.

3.5 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in other Division 09 Sections.
 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. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless-steel jackets.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.7 DUCT INSULATION SCHEDULE, GENERAL

- A. Items Not Insulated:
 - 1. Factory-insulated flexible ducts, plenums, and casings.
 - 2. Factory-insulated plenums and casings.
 - 3. Flexible connectors.
 - 4. Vibration-control devices.
 - 5. Factory-insulated access panels and doors.
- B. EXTERIOR HVAC SUPPLY AIR DUCTS
 - 1. External insulation shall be rigid two (2) inch thick Series 700, "Type 705", 6 lb. density fiberglass "Duct and Equipment Board" with factory applied FRK for reinforced vapor barrier facing. Thermal conductivity of 0.22 BTU/Hr. sq. ft./deg F/inch at 75 deg F mean temperature. Install with PVC corner angles.
 - 2. Insulation board shall be applied over ductwork and between standing seams with all edges, seams and corners tightly butted and square. Secure insulation using Benjamin Foster 85-20 Spark-Fas bonding adhesive applied to 100% of the duct surfaces. In addition to bonding adhesive, insulation shall be impaled over pins welded to ducts or over stick clips. Space pins or clips on 12 inch center and not less than 3 inches from each edge or corner of insulation board. Provide additional pins or clips as required to hold insulation tightly against ductwork with cross breaking. After impaling insulation over pins, secure with speed clips installed over pins and clipping off pins close to speed clips. Cover all joints, fastener penetrations and exposed edges for smooth surface. Slope insulation so jacketing will shed water.
 - 3. Apply self-adhesive elastomeric jacketing system equal to Venture Clad, natural aluminum #1577CW or approved equal including all manufacturer's installation materials to provide a water tight system. Apply in accordance to manufacturer's recommendations.

C.

INTERIOR CONCEALED HVAC SUPPLY DUCTS, RETURN DUCTS, OUTSIDE AIR DUCTS AND PLENUMS				
MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD APPLIED JACKET
GLASS FIBER	BLANKET	1.5* or 2*	YES	NONE
*R=6 Minimum installed R-value.				

EXTERIOR SUPPLY AIR DUCTS AND PLENUMS				
MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD APPLIED JACKET
GLASS FIBER	BOARD	2*	YES	YES
*R=8 Minimum installed R-value				

END OF SECTION 230713

SECTION 230719 - HVAC 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. Cooling Coil Condensate drain piping.
 2. Heating hot-water piping.
 3. Chilled water piping.
 4. Refrigerant piping insulation.

1.3 DEFINITIONS

- A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.
- B. Cold Surfaces: Normal operating temperatures less than 75 deg F.
- C. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F.
- D. Density: Is expressed in pcf.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

1.5 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.

1.6 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.7 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.

1.8 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in other Division 23 Sections.
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.9 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Armacell LLC ; AP Armaflex. or a comparable product by one of the following:
 - a. Aeroflex USA, Inc.
 - b. K-Flex USA.
 - c. Or approved equal.
 - 2. Provide UV protective coating on all insulation exposed to the weather.
- F. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. Knauf Insulation.
 - c. Manson Insulation Inc.
 - d. Owens Corning.
 - e. Or approved equal.
 - 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-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
 - 1. Thermal Conductivity: 1.0 Btu x inch/h x sq. ft. x deg F average maximum at 500 deg F mean temperature.
 - 2. Compressive Strength: 10 psi at 5 percent deformation.
- B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
 - 1. Thermal Conductivity: 1.2 Btu x inch/h x sq. ft. x deg F average maximum at 500 deg F mean temperature.
 - 2. Compressive Strength: 100 psi at 5 percent deformation.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 - 1. Solvent-based, contact adhesive recommended by insulation manufacturer.
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Produced under the UL Classification and Follow-up service.
 - 2. Type: Non-flammable, solvent-based.
 - 3. Service Temperature Range: Minus 20 to 180 deg F.
- D. 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. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.
 - 2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.
- E. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: 60 percent by volume and 66 percent by weight.
 - 4. Color: White.

2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
 - 1. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
 - 2. Service Temperature Range: 0 to plus 180 deg F.
 - 3. Color: White.

2.6 SEALANTS

- A. Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. and water-resistant, flex Fire-ible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: White.

2.7 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-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Fitting Covers: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Adhesive: As recommended by jacket material manufacturer.
 - 2. Color: White.
 - 3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

2.10 SECUREMENTS

- A. Bands:
 1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, stainless 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. 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-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 o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- 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 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 over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- C. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 - 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - 3. Install insulation to flanges as specified for flange insulation application.
 - 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 FIELD-APPLIED JACKET INSTALLATION

- 1. Provide PVC covers and all fittings and valves.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
 - 2. Inspection quantities are a per school basis.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

- A. General: Abbreviations used in the following schedules include:
 - 1. Field-Applied Jackets as an alternate to those specified above: P - PVC, K - Foil and Paper, A - Aluminum, SS - Stainless Steel.
 - 2. Pipe Sizes: NPS - Nominal Pipe Size (DN - Nominal Dimension).
- B. 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.
- C. Provide PVC fittings on all piping unless otherwise noted.

INTERIOR CHILLED AND HEATING HOT WATER HYDRONIC				
PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD APPLIED JACKET
1/2 TO 1-1/4	MINERAL FIBER	1-1/2	YES	NONE
1-1/2 AND LARGER	MINERAL FIBER	2	YES	NONE
INTERIOR COOLING COIL CONDENSATE PIPING				
PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD APPLIED JACKET
1/2 TO 1-1/4	MINERAL FIBER	1/2	YES	NONE
REFRIGERANT PIPING				
PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD APPLIED JACKET
ALL SIZES	FLEXIBLE ELAST.	1	YES	NONE

END OF SECTION 230719

SECTION 232113 - HYDRONIC 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 pipe and fitting materials and joining methods for the following:
 - 1. Copper tube and fittings.
 - 2. Steel pipe and fittings.
 - 3. Joining materials.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Pipe.
 - 2. Fittings.
 - 3. Joining materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Piping layout, drawn to scale.
- B. Qualification Data: For Installer.
- C. Welding certificates.
- D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
- B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

- C. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- D. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. Chilled-Water and Hot-Water Heating Piping: 100 psig at 200 deg F.

2.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
- B. Wrought-Copper Unions: ASME B16.22.

2.3 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.
- B. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.
- C. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- D. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.

2.4 JOINING MATERIALS

- A. 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 otherwise 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.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. NPS 2 and smaller, shall be the following:
 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
- B. NPS over 2 shall be the following:
 1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel

3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.

- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install valves according to the applicable Division 23 Sections.
- P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
- R. Comply with requirements in applicable Division 23 Sections for identifying piping.

3.3 HANGERS AND SUPPORTS

- A. Comply with requirements applicable Division 23 Sections for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
- B. Install the following pipe attachments:
 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 4. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 1. NPS 3/4: Maximum span, 7 feet.
 2. NPS 1: Maximum span, 7 feet.
 3. NPS 1-1/2: Maximum span, 9 feet.
 4. NPS 2: Maximum span, 10 feet.

- D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 - 2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 - 3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 - 4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.

3.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
- F. 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 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.
- C. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in applicable Division 23 Sections.

3.6 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Comply with current International Mechanical Code for test procedures and pressure (for reference, IMC 2015, Section 1208).
2. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
3. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
4. Isolate expansion tanks and determine that hydronic system is full of water.
5. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
6. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
7. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
4. Set temperature controls so all coils are calling for full flow.
5. Verify lubrication of motors and bearings.

3.7 ADJUSTING AND CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect finish. Remove burrs, dirt, and construction debris, and repair damaged finishes including chips, scratches, and abrasions.

- B. Flush hydronic piping systems with clean water. Remove, clean, and replace strainer screens. After cleaning and flushing hydronic piping system, but before balancing, remove disposable fine-mesh strainers in pump suction diffusers.
- C. Mark calibrated nameplates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.

3.8 START-UP

- A. Fill system and perform initial chemical treatment.
- B. Check expansion tanks to determine that they are not air bound and that system is completely full of water.
- C. Perform these steps before operating the system:
 - 1. Open valves to fully open position.
 - 2. Check pump for proper direction of rotation.
 - 3. Set automatic fill valves for required system pressure.
 - 4. Check air vents at high points of systems and determine if all are installed and operating freely (automatic type) or bleed air completely (manual type).
 - 5. Set temperature controls so all coils are calling for full flow.
 - 6. Check and set operating temperatures of chillers and environmental control air conditioning units to design requirements.
 - 7. Lubricate motors and bearings.

END OF SECTION 232113

SECTION 232116 - HYDRONIC 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 ACTION SUBMITTALS

- A. Product Data: For each type of product:
 1. Include construction details and material descriptions for hydronic piping specialties.
 2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
 3. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For hydronic piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 HYDRONIC SPECIALTY VALVES

- A. Bronze, Calibrated-Orifice, Balancing Valves:
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Bell & Gossett; a Xylem brand or a comparable product by one of the following:
 - a. NIBCO INC.
 - b. TACO Comfort Solutions, Inc.
 - c. Victaulic Company.
 - d. Or approved equal.
 2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
 3. Ball: Brass or stainless steel.
 4. Plug: Resin.
 5. Seat: PTFE.
 6. End Connections: Threaded or socket.
 7. Pressure Gage Connections: Integral seals for portable differential pressure meter.

8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

2.2 AIR-CONTROL DEVICES

A. Manual Air Vents:

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. AMTROL, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett; a Xylem brand.
 - d. TACO Comfort Solutions, Inc.
 - e. Or approved equal.
2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225 deg F.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.
- B. Install calibrated-orifice, balancing valves as indicated.

3.2 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual vents at heat-transfer coils and elsewhere as required for air venting.

END OF SECTION 232116

SECTION 233113 - DUCTWORK

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. Rectangular and round ductwork for heating, ventilation, and air-conditioning systems.
 - 2. Duct liner.
 - 3. Sealants and gaskets.
 - 4. Duct hangers and supports.
- B. Construction Requirements:
 - 1. Indicated duct sizes shown on drawings are clear internal dimensions.
 - 2. Systems associated with the various unit ventilators to be spiral lock galvanized steel, painted, field or factory, with color selected by Architect.
 - 3. Construct all ductwork to achieve a Seal Class A per SMACNA Construction Standards.

1.3 DEFINITIONS

- A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C 168. In this Section, these values are the result of the formula $\text{Btu} \times \text{in./h} \times \text{sq. ft.} \times \text{deg F}$ or $\text{W/m} \times \text{K}$ at the temperature differences specified. Values are expressed as Btu or W.
 - 1. Example: Apparent Thermal Conductivity (k-Value): 0.26 or 0.037

1.4 PERFORMANCE REQUIREMENTS

- A. Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Liners and adhesives.
 - 2. Sealants and gaskets.
 - 3. Duct-Design Submittal:
 - a. Sheet metal thicknesses.
 - b. Joint and seam construction and sealing.
 - c. Reinforcement details and spacing.
 - d. Materials, fabrication, assembly, and spacing of hangers and supports.
- B. Shop Drawings:
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Factory- and shop-fabricated ducts and fittings.
 - 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
 - 4. Elevation of top of ducts.
 - 5. Dimensions of main duct runs from building grid lines.
 - 6. Fittings.
 - 7. Reinforcement and spacing.
 - 8. Seam and joint construction.
 - 9. Penetrations through fire-rated and other partitions.
 - 10. Equipment installation based on equipment being used on Project.
 - 11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
 - 12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services (piping, conduits, etc.). Indicate proposed changes to duct layout.
 - 2. Suspended ceiling components.
 - 3. Structural members to which duct will be attached.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Penetrations of smoke barriers and fire-rated construction.
 - 6. Items penetrating finished ceiling including the following:
 - a. Luminaires.

- b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.
- B. Welding certificates.
 - C. Field quality-control reports.
 - D. Record Drawings (As-Built): Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.7 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 - 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.
- C. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems," unless otherwise indicated.
- D. SMACNA: Gages of materials, fabrication, reinforcement, sealing requirements, installation, and method of supporting ductwork shall be in accordance with the following SMACNA manuals, unless otherwise shown or specified:
 - 1. HVAC Duct Construction Standards.
 - 2. Rectangular Industrial Duct Construction Standard.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.
- C. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation.
- D. Duct is to be delivered to the construction site either fully wrapped in plastic or openings are capped with thick plastic to prevent construction debris entering inside duct.

- E. Deliver, store, and protect ductwork from weather damage and physical damage. Provide temporary plastic end caps on open duct ends as work is performed in stages and install as the end of the days' work is completed. Remove the temporary caps as the work progresses.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.
- E. All exhaust ductwork associated with the oven exhaust hoods and residential range hood shall be constructed of aluminum.

2.2 SEALANT AND GASKETS

- A. Indoor Ductwork Sealant: UL Classified and Listed, NFPA 90A and 90B compliant, 0 flame spread/smoke developed ratings, water based, non-flammable, acrylic copolymer with 70% ± 2% solids content, 24 to 72 hour cure time, for use up to 15-inch wg and SMACNA Class A seals. Design Polymerics "DP 1010" or equal.
- B. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - 4. Class: 25.
 - 5. Use: O.
- C. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.3 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- C. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36.
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.4 STATIC PRESSURE CLASSIFICATIONS

- A. Static-Pressure Classifications for Ductwork Construction:
 - 1. Supply ductwork (except as noted otherwise): Pressure classification per the equipment scheduled discharge static pressure; positive pressure (rated for a minimum 2-inches water column).

2.5 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."

2.6 DUCT LINER

- A. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Armacell LLC; or a comparable product by one of the following:
 - a. Aeroflex USA, Inc.
 - b. K-Flex USA.
 - c. Rubatex International, LLC.
 - d. Or approved equal.
 2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
 3. Thickness shall be equal to minimum R=6.
 4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
- B. Insulation Pins and Washers:
1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 3. Butt transverse joints without gaps, and coat joint with adhesive.
 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
 6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
 7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
 8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
 9. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- 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, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, if applicable, install fire dampers. Comply with requirements in the applicable Division 23 Sections.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.
- M. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.
- N. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: To suit existing construction.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with applicable Division 23 Sections
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Duct System Cleanliness Tests:
 - 1. Visually inspect duct system to ensure that no visible contaminants are present.
 - 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 START UP

- A. Air Balance: Comply with requirements in applicable Division 23 Sections.

END OF SECTION 233113

SECTION 233300 - 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. Turning vanes.
 - 3. Flexible connectors.
 - 4. Duct accessory hardware.

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.

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.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- 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 minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

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-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 thick.
 - 5. Blade Axles: Galvanized steel.
 - 6. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

7. Tie Bars and Brackets: Galvanized steel.
- B. Jackshaft:
1. Size: 0.5-inch diameter.
 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
 2. Include center hole to suit damper operating-rod size.
 3. Include elevated platform for insulated duct mounting.

2.4 TURNING VANES

- A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- B. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vaness and Vane Runners," and 4-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall.

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 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 oz./sq. yd..
 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 3. Service Temperature: Minus 40 to plus 200 deg F.

2.6 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Compliance with ASHRAE/IESNA 90.1-2004 includes Section 6.4.3.3.3 - "Shutoff Damper Controls," restricts the use of backdraft dampers, and requires control dampers for certain applications. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 2. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 3. Upstream from turning vanes.
 - 4. Control devices requiring inspection.
 - 5. Elsewhere as indicated.
- H. Install access doors with swing against duct static pressure.

- I. Label access doors according to applicable Division 23 Sections to indicate the purpose of access door.
- J. Install flexible connectors to connect ducts to equipment.
- K. Connect flexible ducts to metal ducts with draw bands.
- L. Install duct test holes where required for testing and balancing purposes.

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 dampers to verify full range of movement.
 - 4. Inspect turning vanes for proper and secure installation.
 - 5. Operate remote damper operators to verify full range of movement of operator and damper.

3.3 ADJUSTING

- A. Adjust duct accessories for proper settings.
- B. Final positioning of manual-volume dampers is specified in applicable Division 23 Section.

END OF SECTION 233300

SECTION 233713 - AIR DIFFUSERS, REGISTERS, & GRILLES

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 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Data Sheet: For each type of air outlet and inlet and accessory furnished; indicate materials of construction, finish, and mounting details
 - 2. Performance data including throw and drop, static-pressure drop, and noise ratings.
 - a. Provide breakouts by neck size and indicate associated airflow ranges. Indicate minimum and maximum throw & drop data, static-pressure drop, and noise ratings for each indicated neck size and airflow range (min/max).
 - b. Manufacturer's standard performance data sheets are NOT ACCEPTABLE.
 - 3. Schedule of diffusers and registers: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.
 - 4. Assembly Drawings: For each type of air outlet and inlet; indicate materials and methods of assembly of components.
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for diffusers, registers, and grilles with factory-applied color finishes.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. 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.

- B. Source quality-control reports.

1.4 QUALITY ASSURANCE

- A. Product Options: Drawings and schedules indicate specific requirements of diffusers, registers, and grilles and are based on the specific requirements of the systems indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 01.
- B. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."
- C. Single Source Responsibility: Diffusers, registers, and grilles of the Type identified shall be provided from the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Titus model indicated, or comparable product by one of the following:
 - a. Tuttle & Bailey.
 - b. Price.
 - c. Titus
 - d. Or approved equal.

2.2 PRODUCT

- A. Diffusers: The ceiling diffusers shall be 360 degree pattern, with 3 concentric cones, heavy gauge steel, with molded insulation blanket (minimum R=6), removal of core via hex key, balancing damper with screwdriver adjustment and 24X24 lay in panel for acoustical tile ceiling.
- B. Return grilles:
 - 1. Return grilles and registers have fixed horizontal bars spaced 3/4 inch centers with 35 deg face deflection, unless otherwise noted, blades parallel to the long dimension.
 - 2. Where indicated: overlap margin - 1 1/4 inch nominal width. Furnished with countersunk screw holes and mounting screws, or tee bar lay in panel.
 - 3. Construction - rigid heavy-gauge margins with reinforced mitered corners.
 - 4. Roll-formed bars - streamlined shaped rigid steel bars on 3/4 inch centers, deflected. Bars driven on swaged pins are firmly held by mullions welded behind grille face.
 - 5. Integral dampers - double thickness roll-formed steel blades. Opposed blade damper designed for key or screwdriver operation.

6. Provide panels for tee bar lay in ceiling systems.
 7. Finish shall be anodic acrylic paint, baked.
- C. Steel construction unless otherwise noted.
 - D. Provide opposed blade dampers on air devices.
 - E. Noise level not to exceed effective total noise of 25 NC for classrooms (based on air device quantities), otherwise not to exceed 35 NC, or as noted.
 - F. Provide lay-in panels for T-bar ceiling types (supply, return and exhaust air systems).
 - G. Drywall: Mounting frame type (surface mount).
 - H. Finish to be baked enamel (unless otherwise noted), color to be approved by Architect. Provide color chart.
 - I. Static pressure not to exceed as scheduled or 0.1-inches w.c. except where indicated on schedule.
 - J. Confirm required mounting frames with field conditions and Architectural Drawings.

2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers 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 are 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 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 the panel. Where architectural features or other items conflict with installation, notify Professional 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 to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

- A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION 233713

SECTION 237416 - PACKAGED, ROOFTOP AIR-CONDITIONING UNITS WITH HEAT RECOVERY

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 ACTION SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each rooftop, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- B. Shop Drawings:
 - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Include diagrams for power, signal, and control wiring.
- C. Delegated-Design Submittal: For RTU supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Include design calculations for selecting vibration isolators and for designing vibration isolation bases.
 - 2. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans and other details, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.
- B. Sample Warranty: For manufacturer's warranty.
- C. Source quality-control reports.
- D. System startup reports.
- E. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. AHRI Compliance:
 - 1. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
 - 2. Comply with AHRI 270 for testing and rating sound performance for RTUs.
 - 3. Comply with AHRI 1060 for testing and rating performance for air-to-air exchanger.
- B. AMCA Compliance:
 - 1. Comply with AMCA 11 and bear the AMCA-Certified Ratings Seal for air and sound performance according to AMCA 211 and AMCA 311.
 - 2. Damper leakage tested in accordance with AMCA 500-D.
 - 3. Operating Limits: Classify according to AMCA 99.
- C. ASHRAE Compliance:
 - 1. Comply with ASHRAE 15 for refrigeration system safety.
 - 2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
 - 3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- E. NFPA Compliance: Comply with NFPA 90A or NFPA 90B.
- F. UL Compliance: Comply with UL 1995.
- G. 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 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of RTUs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
 - 2. Warranty Period for Energy Recovery Wheel: Manufacturer's standard, but not less than five years from date of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Unit shall be shipped with doors screwed shut and outside air hood closed to prevent damage during transport and thereafter while in storage awaiting installation.
- B. Follow Installation, Operation, and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.
- C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation, and Maintenance manual.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: 2 set(s) of filters for each unit.
 - 2. Gaskets: [One] set(s) for each access door.
 - 3. Fan Belts: One set(s) for each belt-driven fan.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings "Carrier Corporation" or comparable product by one of the following:
 - 1. Carrier.
 - 2. YORK; a Johnson Controls company.
 - 3. Trane
 - 4. Aeon

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of RTUs and components.
- C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. UL Compliance: Comply with UL 1995.

- E. Vibration Isolation Design: Engage a qualified professional engineer, as defined in applicable Division 01 Sections to select vibration isolation rails and perform the associated vibration isolation calculations.

2.3 GENERAL DESCRIPTION

- A. Packaged rooftop unit shall include compressors, evaporator coils, filters, supply fans, dampers, air-cooled condenser coils, condenser fans, and unit controls.
- B. Unit shall be factory assembled and tested including leak testing of the DX coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment's literature pocket.
- C. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
- D. Unit components shall be labeled, including refrigeration system components and electrical and controls components.
- E. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.
- F. Installation, Operation, and Maintenance manual shall be supplied within the unit.
- G. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
- H. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

2.4 CONSTRUCTION

- A. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels
- B. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610 deg F.
- C. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.
- D. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in applicable AHRI Standard (340/360 or 210/240). Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of

positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

- E. Roof of the unit shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
- F. Access to filters, dampers, cooling coils, compressors, and electrical and controls components as applicable, shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.
- G. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
- H. Units with cooling coils shall include double sloped 304 stainless steel drain pans.
- I. Units with vertical discharge: Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.
- J. Unit shall include lifting lugs on the top of the unit.
- K. Unit base pan shall be provided with 1/2 inch thick foam insulation.
- L. Unit shall include factory wired control panel compartment LED service lights.

2.5 ELECTRICAL

- A. Unit shall be provided with single connection of power to unit with factory installed and factory wired, non-fused disconnect switch.
- B. Unit shall be provided with a factory installed and factory wired 115V, 12 amp GFI outlet disconnect switch in the unit control panel.
- C. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.

2.6 SUPPLY FANS

- A. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
- B. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

- C. Variable frequency drives shall include BACnet communications connection.

2.7 COOLING COILS

A. Evaporator Coils:

1. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
2. Coils shall be hydrogen or helium leak tested.
3. Coils shall be furnished with factory installed expansion valves.
4. Coils shall be sized to meet the capacity and pressure loss requirements indicated for the drawings.

2.8 REFRIGERATION SYSTEM

- A. Unit shall be factory charged with R-410A refrigerant.
- B. Compressors shall be scroll type with thermal overload protection.
- C. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the transmission of noise outside the cabinet.
- D. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.
- E. Each refrigeration circuit shall be equipped with expansion valve type refrigerant flow control.
- F. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides and a factory installed replaceable core liquid line filter driers.
- G. For units with multiple compressors:
 1. Unit shall include a variable capacity scroll compressor on the lead refrigeration circuit which shall be capable of modulation from 10-100% of its capacity.
 2. Lead refrigeration circuit shall be provided with hot gas reheat coil (where indicated), modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.

2.9 CONDENSERS

A. Air-Cooled Condenser:

1. Condenser fans shall be a vertical discharge, axial flow, direct drive fans.
2. Coils shall be designed for use with R-410A refrigerant.
3. Condenser coils shall be multi-pass and fabricated from aluminum microchannel tubes.
4. Coils shall be designed for a minimum of 10 deg F of refrigerant sub-cooling.
5. Coils shall be hydrogen or helium leak tested.
6. Condenser fans shall be VFD driven variable speed for condenser head pressure control. Factory provided and factory programmed VFDs shall continuously modulate the fan air flow to maintain head pressure at acceptable levels. Cooling operation shall be allowed down to 35 deg F with adjustable compressor lockouts.

2.10 FILTERS

- A. Unit shall include 4 inch thick, pleated panel filters with an ASHRAE MERV rating of 13, upstream of the cooling coil and downstream of the mixed air connection. Unit shall also include 2 inch thick, pleated panel pre filters with an ASHRAE MERV rating of 8, upstream of the MERV 13 filters.
- B. Unless noted otherwise, unit shall include 1 inch aluminum mesh pre filters upstream of the outside air opening.

2.11 OUTSIDE AIR/ECONOMIZER

- A. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq. ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Damper assembly shall be controlled by spring return enthalpy activated fully modulating actuator. Unit shall include outside air opening bird screen, outside air hood, and barometric relief dampers.

2.12 ROOF CURB

- A. New rooftop unit vibration isolation rails shall be provided with matching adapter curbs to exactly match new unit's supply and return connections to match existing roof curbs without further modification in the field.
- B. Provide spring isolation rail between the unit and the new curb.

2.13 CONTROLS

- A. Factory Installed and Factory Provided Localized Controller and network card for future use.
- B. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested. Controller shall be capable of stand-alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
- C. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.
- D. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
- E. Interface Requirements for HVAC Instrumentation and Control System:
 - 1. Interface relay for scheduled operation.
 - 2. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.
 - 3. Provide BACnet compatible interface for central HVAC control workstation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.
- B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.
- C. Examine roofs for suitable conditions where RTUs will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's rigging and installation instructions for unloading units and moving to final locations.
- A. Roof Curb: Install on roof structure, level and secure, according to NRCA's "NRCA Roofing Manual: Membrane Roof Systems." or AHRI Guideline B. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction. Secure RTUs to upper curb rail, and

secure curb base to roof framing or concrete base with anchor bolts. Coordinate sizes and locations of roof curbs with actual equipment provided.

3.3 PIPING CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to RTU, allow space for service and maintenance.
- C. Connect piping to unit mounted on vibration isolators with flexible connectors.
- D. Connect condensate drain pans using ASTM B88, Type DWV copper tubing. Size condensate drain piping per the rooftop unit manufacturer's recommendations. Extend to piping down and terminate with a splash block at the roof. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
- E. Hot- and Chilled-Water Piping: Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.

3.4 DUCT CONNECTIONS

- A. Comply with duct installation requirements specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
 - 1. Install ducts to termination at side of roof curb.
 - 2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
 - 3. Connect supply & return ducts to RTUs with flexible duct connectors specified in applicable Division 23 Sections.

3.5 ELECTRICAL CONNECTIONS

- A. Connect electrical wiring according to applicable Division 26 Sections.
- B. Ground equipment according to applicable Division 26 Sections.
- C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 - 1. Nameplate shall be laminated acrylic or melamine plastic signs as layers of black with engraved white letters at least 1/2 inch high.

2. Locate nameplate where easily visible.

3.6 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring according to applicable Division 26 Sections.

3.7 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions.
 1. Inspect for visible damage to unit casing.
 2. Inspect for visible damage to furnace combustion chamber.
 3. Inspect for visible damage to compressor, coils, and fans.
 4. Inspect internal insulation.
 5. Verify that labels are clearly visible.
 6. Verify that clearances have been provided for servicing.
 7. Verify that controls are connected and operable.
 8. Verify that filters are installed.
 9. Clean condenser coil and inspect for construction debris.
 10. Remove packing from vibration isolators.
 11. Verify lubrication on fan and motor bearings.
 12. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
 13. Adjust fan belts to proper alignment and tension.
 14. Start unit according to manufacturer's written instructions.
 - a. Start refrigeration system.
 - b. Do not operate below recommended low-ambient temperature.
 - c. Complete startup sheets and attach copy with Contractor's startup report.
 15. Inspect and record performance of interlocks and protective devices; verify sequences.
 16. Operate unit for an initial period as recommended or required by manufacturer.
 17. Calibrate temperature sensors.
 18. Adjust and inspect high-temperature limits.
 19. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
 20. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:
 - a. Coil leaving-air, dry- and wet-bulb temperatures.
 - b. Coil entering-air, dry- and wet-bulb temperatures.
 - c. Outdoor-air, dry-bulb temperature.
 - d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

21. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
22. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
 - a. Supply-air volume.
 - b. Return-air volume.
 - c. Relief-air volume.
 - d. Outdoor-air intake volume.
23. Simulate maximum cooling demand and inspect the following:
 - a. Compressor refrigerant suction and hot-gas pressures.
 - b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.
24. Verify operation of remote panel including failure modes. Inspect the following:
 - a. Low-temperature safety operation.
 - b. Filter high-pressure differential alarm.
 - c. Economizer to minimum outdoor-air changeover.
 - d. Relief-air fan operation.
 - e. Smoke and firestat alarms.
25. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.8 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Comply with requirements in applicable Division 23 Sections for air-handling system testing, adjusting, and balancing.
- C. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.9 CLEANING

- A. After completing system installation and testing, adjusting, and balancing RTUs and air-distribution systems and after completing startup service, clean RTUs internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.10 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Tests and inspections:
 - 1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
 - 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. RTU will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.11 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.
 - 1. Train maintenance personnel for 4 hours minimum on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining unit.
 - 2. Review data in maintenance manuals.
 - 3. Schedule training with at least seven days' advance notice.

END OF SECTION 237416

SECTION 237433 - DEDICATED OUTDOOR-AIR UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes factory-assembled, dedicated outdoor air-handling units, including multiple components, capable of heating and cooling 100 percent outdoor air.

1.3 DEFINITIONS:

- A. ECM: Electronically commutated motor.
- B. IS COP: Integrated Seasonal Coefficient of Performance.
- C. ISMRE: Integrated Seasonal Moisture Removal Efficiency.
- D. MRC: Moisture Removal Capacity.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include:
 - 1. Rated capacities.
 - 2. Operating characteristics.
 - 3. Computer generated fan curves for each fan with specific design operation point noted.
 - 4. Wiring diagrams with details for both power and control systems and differentiation between factory installed and field installed wiring.
 - 5. Furnished specialties and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Prepare the following by or under the supervision of a qualified professional engineer:

- a. Mounting Details: For securing and flashing roof curb to roof structure. Indicate coordinating requirements with roof support system.
 - b. Include diagrams for power, signal, and control wiring.
- C. Vibration Isolation-Design Submittal (Cedar Creek HS unit only; Oakcrest unit mounted on grade): For design of vibration isolation, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Unit fabrication and assembly details.
 - 2. Vibration Isolation Base Rail Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
 - 3. Design Calculations:
 - a. Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
 - b. Indicate compliance with "Performance Requirements" article.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof-curb mounting details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Size and location of unit-mounted rails and anchor points and methods for anchoring units to roof curb.
 - 2. Required roof penetrations for ducts, pipes, and electrical raceways, including size and location of each penetration.
- B. Startup service reports.
- C. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For units to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: Two set for each unit.
 - 2. Filters: One set for each unit.

3. Gaskets: One set for each unit.

1.8 QUALITY ASSURANCE

- A. Unit shall be certified in accordance with ANSI/AHRI Standard 340/360 performance rating of commercial and industrial unitary air-conditioning and heat pump equipment; ASHRAE Standard 37 and AHRI Standard 270/370.
- B. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.
- C. Unit shall be certified in accordance with ANSI Z21.47b/CSA 2.3b and ANSI Z83.8/CSA 2.6, Safety Standard Gas-Fired Furnaces.
- D. Unit Energy Efficiency Ratio (EER) shall be equal to or greater that prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.
- E. Unit shall be safety certified by ETL and ETL US listed. Unit nameplate shall include the ETL/ETL Canada label.
- F. Unit shall be installed by a qualified installer per the manufacturer's installation instructions shipped with the unit.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Unit shall be shipped with doors screwed shut and outside air hood closed to prevent damage during transport and thereafter while in storage awaiting installation.
- B. Follow Installation, Operation, and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.
- C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation, and Maintenance manual.

1.10 WARRANTY

- A. Warranty: Manufacturer agrees to replace components of units that fail in materials or workmanship within specified warranty period.
 1. Warranty Period for Compressors: Five years (non-prorated) from date of Substantial Completion. Should any part of the equipment prove to be defective in material or workmanship within the 5-year period, upon examination by the manufacturer, such part will be repaired or replaced by the manufacturer at no charge. The owner shall pay all labor costs incurred in connection with such repair or replacement.
 2. Warranty Period for Stainless Steel Gas Heat Exchangers: 25 years (non-prorated) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. AAON (Basis of design).
 2. Carrier Corporation.
 3. York (Johnson Controls Company).
 4. Trane.

2.2 PERFORMANCE REQUIREMENTS

- A. Vibration Isolation Design: Engage a qualified professional engineer, as defined in applicable Division 01 Sections to select vibration isolation rails and perform the associated vibration isolation calculations.
- 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. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of units and components.
- D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

2.3 GENERAL DESCRIPTION

- A. Packaged rooftop unit shall include compressors, evaporator coils, filters, supply fans, dampers, air-cooled condenser coils, condenser fans, reheat coil (refer to drawing schedule) and gas heaters.
- B. Unit shall be factory assembled and tested including leak testing of the DX coils, pressure testing of the refrigeration circuit, and testing of the completed unit. Test report shall be supplied with the unit in the service compartment's literature pocket.
- C. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
- D. Unit components shall be labeled, including refrigeration system components and electrical and controls components.
- E. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.
- F. Installation, Operation, and Maintenance manual shall be supplied within the unit.

- G. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
- H. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

2.4 CONSTRUCTION

- A. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
- B. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610-deg F.
- C. Unit construction shall be double wall with minimum 20-gauge G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.
- D. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.
- E. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
- F. Access to filters, dampers, cooling coils, reheat coil, heaters, exhaust fans, compressors, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.
- G. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117 test procedure.
- H. Units with cooling coils shall include double sloped 304 stainless steel drain pans.
- I. Unit shall be provided with base discharge and return air openings (where applicable – see schedule). All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.
- J. Base shall be factory insulated minimum R-13.

- K. Unit shall include lifting point on all four sides.
- L. Unit base pan shall be provided with 1/2 inch thick foam insulation.
- M. Unit shall include factory wired control panel compartment LED service lights.

2.5 ELECTRICAL

- A. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch. Unit shall be provided with a door safety switch that de-energizes the supply fan when the door is opened.
- B. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.
- C. All controls shall be pre-wired and housed in an insulated electrical cabinet within the unit to protect against risk of condensation.
- D. The unit shall be provided with LED electrical cabinet service light with automatic activation upon door switch.
- E. Provide with powered convenience outlet 120V/15amp off line side of connection.

2.6 SUPPLY FANS

- A. Blowers and motors shall be dynamically balance and mounted on rubber isolators.
- B. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
- C. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.
- D. Unit shall be furnished with total CRM monitoring to measure airflow across supply discharge.

2.7 COOLING COILS

- A. Evaporator Coils:
 - 1. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
 - 2. Coils capacity shall be as required to meet the capacities indicated on the Drawings.
 - 3. Coils shall be hydrogen or helium leak tested.
 - 4. Coils shall be furnished with factory installed expansion valves.

2.8 REFRIGERATION SYSTEM

- A. Unit shall be factory charged with R-410A refrigerant.
- B. Compressors shall be variable speed inverter duty scroll type with thermal overload protection.
- C. Modulation: Compressor shall be capable of compressor speed modulation from 15%-100% (Oakcrest HS unit). Compressor shall be capable of compressor speed modulation from 25%-100% (Cedar Creek HS unit).
- D. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.
- E. Each refrigeration circuit shall be equipped with expansion valve type refrigerant flow control.
- F. Compressor shall include a crankcase heater to protect against liquid flood-back and elimination of oil foaming on startup. The crankcase heater must remain powered when the compressor is not in operation.
- G. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides and a factory installed replaceable core liquid line filter driers.
- H. Refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.
- I. Indoor coil shall be a high efficiency 4-10 row coil design with aluminum fins mechanically bonded to copper tubes. Coil is staggered to increase turbulence, reduce the coil bypass factor, and ultimately increase the time the air stays within the coil. Includes two probe sensors to read average coil face temperature.
- J. Unit shall monitor all critical refrigeration points to ensure compressor does not operate outside of safe operating envelope.

2.9 CONDENSERS

- A. Air-Cooled Condenser:
 - 1. Condenser fans shall be vertical discharge.
 - 2. Coils shall be designed for use with R-410A refrigerant. Coils shall be multi-pass and fabricated with aluminum fins mechanically bonded to copper tubes.
 - 3. Coils shall be hydrogen or helium leak tested.
 - 4. Provide with hail guards.

5. Condenser fans shall be high efficiency electrically commutated motor driven with factory installed head pressure control module. Condenser airflow shall continuously modulate based on head pressure and cooling operation shall be allowed down to 35 deg F with adjustable compressor lockout.

2.10 FILTERS

- A. Unit shall include mixed air 2 inch thick, pleated panel filters with an MERV rating of 13, upstream of the cooling coil.
- B. Unit shall include 2 inch washable metal mesh pre filters upstream of the outside air opening.
- C. All filters shall be installed on tracks for easy removal from the unit.
- D. Unit shall include a clogged filter switch.

2.11 OUTSIDE AIR INTAKE

- A. Unit shall include 100% motor operated outside air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge and end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Damper assembly shall be controlled by spring return, modulating actuator. Unit shall include outside air opening bird screen and louver/gutter system.

2.12 CONTROLS

- A. Controller by DOAS unit manufacturer to allow full control of the entire unit. Refer to applicable sections in division 23.
- B. Control Wiring: Factory wire connection for controls' power supply.
- C. Control Devices: Sensors, transmitters, relays, switches, detectors, operators, actuators, and valves shall be manufacturer's standard items to accomplish indicated control functions.
- D. Unit shall be provided with a factory mounted averaging supply air temperature sensor to allow for accurate discharge temperature readings within unit.
- E. Provide air flow switch on the supply fan system to sense air flow with available set of contacts for connection to BMS for airflow alerts.
- F. All unit controls shall be compatible with BACnet and LonWorks based building management systems.
- G. Sequence of operation refer to drawings and applicable division 23 sections.

2.13 ROOF CURBS

- A. Units shall be factory assembled and constructed of 16GA galvanized steel. Curb shall be factory outfitted with duct support hangers.
- B. Curb shall be 20" high and fully insulated with 1" acoustical and thermal insulation.

2.14 VARIABLE SPEED DRIVES

- A. Variable Frequency Drive for the compressor as part of the AC unit. VFD shall be furnished and installed to meet the performance set forth in the schedule.
- B. Provide Variable Frequency Drive for speed control on all non-ECM direct drive supply fans.
- C. All VFDs shall provide the following inherent protections: Phase protection; brownout protection; overload/overheat protection; soft starts to protect bearings/hardware; low & high voltage & over-torque protections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping, ducts, and electrical systems to verify actual locations of connections before equipment installation.
- C. Examine roof curbs and equipment supports for suitable conditions where units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's rigging and installation instructions for unloading units and moving to final locations.
- B. Curb Support: Install roof curb on roof structure according to "The NRCA Roofing Manual."
 - 1. Install and secure units on curbs and coordinate roof penetrations and flashing with roof construction.
 - 2. Coordinate size, installation, and structural capacity of roof curbs, equipment supports, and roof penetrations.

3. Coordinate size, location, and installation of unit manufacturer's roof curbs and equipment supports.
- C. Equipment Mounting:
1. Comply with requirements for vibration isolation devices specified in applicable Division 23 Sections.
- D. Wall- and duct-mounted sensors provided by the DOAS manufacturer.
- E. Comply with requirements for gas-fired furnace installation in NFPA 54, "National Fuel Gas Code."
- F. Install separate devices furnished by manufacturer and not factory installed.
1. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.
 2. Install drain pipes from rooftop unit drain pans to roof drains:
 - a. Drain Piping: Schedule 40 PVC.
 - b. Pipe Size: Same size as condensate drain pan connection.

3.3 CONNECTIONS

- A. Where installing piping adjacent to units, allow space for service and maintenance.
- B. Duct Connections:
1. Comply with requirements in applicable Division 23 Sections.
 2. Drawings indicate the general arrangement of ducts.
 3. Connect ducts to units with flexible duct connectors. Comply with requirements for flexible duct connectors in applicable Division 23 Sections.
- C. Electrical Connections: Comply with requirements for power wiring, switches, and motor controls in electrical Sections.
1. Install electrical devices furnished by unit manufacturer but not factory mounted.

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.
 2. Inspect units for visible damage to furnace combustion chamber.
 3. Perform the following operations for both minimum and maximum firing and adjust burner for peak efficiency:

- a. Measure gas pressure at manifold.
 - b. Measure combustion-air temperature at inlet to combustion chamber.
 - c. Measure flue-gas temperature at furnace discharge.
 - d. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
 - e. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
4. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:
 - a. High-limit heat exchanger.
 - b. Alarms.
 5. Inspect units for visible damage to refrigerant compressor, condenser and evaporator coils, and fans.
 6. Start refrigeration system when outdoor-air temperature is within normal operating limits and measure and record the following:
 - a. Cooling coil leaving-air, dry- and wet-bulb temperatures.
 - b. Cooling coil entering-air, dry- and wet-bulb temperatures.
 - c. Condenser coil entering-air dry-bulb temperature.
 - d. Condenser coil leaving-air dry-bulb temperature.
 7. Simulate maximum cooling demand and inspect the following:
 - a. Compressor refrigerant suction and hot-gas pressures.
 - b. Short-circuiting of air through outside coil or from outside coil to outdoor-air intake.
 8. Inspect casing insulation for integrity, moisture content, and adhesion.
 9. Verify that clearances have been provided for servicing.
 10. Verify that controls are connected and operable.
 11. Verify that filters are installed.
 12. Clean coils and inspect for construction debris.
 13. Inspect operation of power vents.
 14. Inspect and adjust vibration isolators.
 15. Verify bearing lubrication.
 16. Clean fans and inspect fan-wheel rotation for movement in correct direction without vibration and binding.
 17. Adjust fan belts to proper alignment and tension.
 18. Start unit.
 19. Operate unit for run-in period.
 20. Calibrate controls.
 21. Adjust and inspect high-temperature limits.
 22. Inspect outdoor-air dampers for proper stroke.
 23. Verify operational sequence of controls.
 24. Measure and record the following airflows. Plot fan volumes on fan curve.

- a. Supply-air volume.
- B. After startup, change filters, verify bearing lubrication, and adjust belt tension.
- C. Remove and replace components that do not properly operate and repeat startup procedures as specified above.
- D. Prepare written report of the results of startup services.

3.5 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.
 - 1. Train maintenance personnel for 4 hours minimum on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining unit.
 - 2. Review data in maintenance manuals.
 - 3. Schedule training with at least seven days' advance notice.

END OF SECTION 237433

SECTION 238239.19 - WALL AND CEILING UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes wall and ceiling heaters with propeller/centrifugal fans and hot-water heating coils.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include details of anchorages and attachments to structure and to supported equipment.
 - 4. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
 - 5. Wiring Diagrams: Power, signal, and control wiring.
 - 6. Indicate location and arrangement of piping valves and specialties.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wall and ceiling unit heaters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- A. Assembly including chassis, hot-water heating coil, fan, motor, and controls. Comply with UL 2021.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 CABINET

- A. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.
- B. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- D. Surface-Mounted Cabinet Enclosure: Steel with finish to match cabinet.

2.3 COIL

- A. Hot-Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F Include manual air vent and drain.

2.4 CONTROLS

- A. Controls: Unit-mounted thermostat.
- B. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.
- C. Factory, Hot-Water Piping Package: ASTM B88, Type L copper tube with wrought-copper fittings and brazed joints. Label piping to indicate service, inlet, and outlet.
 - 1. Three-way, modulating control valve. Three-way valve packages shall include bypass line with manually adjustable balance device.
 - 2. Hose Kits: Minimum 400-psig working pressure, and operating temperatures from 33 to 211 deg F . Tag hose kits to equipment designations.
 - 3. Two-Piece, Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.

4. Calibrated-Orifice Balancing Valves: Bronze body, ball type, 125-psig working pressure, 250 deg F maximum operating temperature; with calibrated orifice or venture, connection for portable differential pressure meter with integral seals, threaded ends, and equipped with a memory stop to retain set position.
5. Y-Pattern, Hot-Water Strainers: Cast-iron body (ASTM A126, Class B); 125-psig minimum working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 1/2 threaded pipe and full-port ball valve in strainer drain connection.
6. Wrought-Copper Unions: ASME B16.22.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive wall and ceiling unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical connections to verify actual locations before unit-heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wall and ceiling unit heaters to comply with NFPA 90A.
- B. Install wall and ceiling unit heaters level and plumb.
- C. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.
- D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

END OF SECTION 238239.19

PART 6

ELECTRICAL WORK

SECTION 260010 - GENERAL REQUIREMENTS ELECTRICAL

TABLE OF CONTENTS

PART 1 - GENERAL REQUIREMENTS ELECTRICAL

- 1.1 GENERAL
- 1.2 SCOPE AND OBJECTIVES OF THE ELECTRICAL WORK
- 1.3 INTENT OF THE ELECTRICAL CONTRACT DOCUMENTS
- 1.4 PROPOSAL PREPARATION
- 1.5 HAZARDOUS MATERIALS
- 1.6 DRAWINGS AND SPECIFICATIONS
- 1.7 LAWS, ORDINANCES, REGULATIONS AND PERMITS
- 1.8 TESTS
- 1.9 CLEANING
- 1.10 INSTRUCTING OWNER'S PERSONNEL
- 1.11 OPERATING AND MAINTENANCE INSTRUCTIONS
- 1.12 GUARANTEE
- 1.13 ENTRANCE OF EQUIPMENT
- 1.14 VISIT TO SITE
- 1.15 REQUESTS FOR INFORMATION, RFI(s)
- 1.16 AS-BUILT DRAWINGS
- 1.17 SERVICING OF EQUIPMENT AND SYSTEMS
- 1.18 SERVICING OF EQUIPMENT AND SYSTEMS (EXISTING/UNMODIFIED)
- 1.19 CONTINUITY OF SERVICES
- 1.20 CONTINUITY OF INTERIOR BUILDING SERVICE UTILITIES
- 1.21 TEMPORARY FACILITIES, UTILITIES AND HEATING
- 1.22 SMOKE AND FIRESTOPPING (GENERAL)
- 1.23 COORDINATION DRAWINGS
- 1.24 TRADE CONTRACTOR'S CERTIFICATION

PART 2 - PRODUCTS

- 2.1 MANUFACTURER'S AND SUB-CONTRACTORS LIST, KEYMEN RESUMES
- 2.2 SUBMITTALS
- 2.3 MATERIALS AND EQUIPMENT
- 2.4 EQUIPMENT VARIATIONS AND SUBSTITUTIONS
- 2.5 VIBRATION ELIMINATION
- 2.6 NOISE CONTROL
- 2.7 INSERTS, HANGER SUPPORTS, CLAMPS, FASTENINGS
- 2.8 ACCESS DOORS AND PANELS
- 2.9 EQUIPMENT ANCHOR BOLTS
- 2.10 PIPING AND CONDUIT SLEEVES
- 2.11 SMOKE/FIRESTOPPING (MATERIALS)
- 2.12 FIRE/SMOKE DAMPERS, SMOKE DETECTORS/SMOKE DETECTOR CONTROL

PART 3 - EXECUTION

- 3.1 METHOD OF PROCEDURE
- 3.2 PROTECTION OF WORK
- 3.3 CUTTING AND PATCHING
- 3.4 CONCRETE AND MASONRY
- 3.5 SUPPORTS
- 3.6 ESCUTCHEONS
- 3.7 MACHINERY GUARDS
- 3.8 PAINTING AND FINISHING
- 3.9 LUBRICATION
- 3.10 ELECTRICAL TRADE COORDINATION
- 3.11 ELECTRICAL MOTORS AND STARTERS
- 3.12 ELECTRICAL PROVISIONS FOR PACKAGED MECHANICAL EQUIPMENT
- 3.13 PIPING AND CONDUIT UNDER FLOORS
- 3.14 EQUIPMENT IDENTIFICATION
- 3.15 ABANDONMENT, REMOVAL AND RELOCATION
- 3.16 SMOKE AND FIRESTOPPING (METHODS)
- 3.17 CONCRETE PATCHING (PROCEDURE)
- 3.18 TEMPORARY PARTITIONS
- 3.19 INITIAL APPLICATION FOR PAYMENT
- 3.20 FINAL APPLICATION FOR PAYMENT
- 3.21 ADDITIONAL ELECTRICAL TRADE CONTRACTOR PAID FEES AND EXPENSES
- 3.22 FORMS

PART 1 - GENERAL REQUIREMENTS ELECTRICAL

1.1 GENERAL

- A. The conditions of Divisions 00 and 01 apply to each and every Trade Contractor or other person or persons supplying any material or labor entering this building and/or site, either directly or indirectly. In the event of a conflict between Section 260010 and Divisions 00 and 01, the terms of Divisions 00 and 01 shall govern.
- B. One Building Trade, the Electrical Building Trade, will be covered by these General Requirements Electrical.
- C. For simplicity, this Building Trade will be referred to further herein as the Electrical Trade Contractor. The Electrical Specifications and all Electrical Drawings, together with all addenda make-up the Electrical Contract Documents, and are a part of the "Project Contract Documents", as described throughout these specifications.
- D. The term "Electrical Trade" as used in the Contract Documents, means the Electrical Building Trade.
- E. The term "indicated" means all information included, detailed, shown and/or implied on the Contract Documents.
- F. The term "existing" is used generally in reference to renovation projects. On new construction projects, the term "existing" is intended to mean work already in place.

1.2 SCOPE AND OBJECTIVES OF THE ELECTRICAL WORK

- A. The Scope and Objectives of the Electrical Work of this Project include, but are not limited to:
 - 1. Refer to Division 01 for Scope of Work and of Alternate Bids;
 - 2. Periodic inspection of completed work and site conditions by the Electrical Trade Contractor's Project Manager to confirm compliance with contract documents and verify suitability to receive subsequent work.
 - 3. Provide electrical distribution branch wiring;
 - 4. Provide lighting and convenience power outlets;
 - 5. Provide fire alarm system components as indicated;
 - 6. Provide public address system components as indicated;
 - 7. Provide conduit and box system for data communication systems;
 - 8. Prepare and submit as a shop drawing, minimum 1/4" to the foot scale sketches indicating compliance with code clearance, and equipment manufacturer's recommended clearance for maintenance typical for all electrical equipment, gear panels, electrical rooms and closets. Review clearance with owner's maintenance personnel prior to submitting shop drawing for review and prior to proceeding with physical work.

1.3 INTENT OF THE ELECTRICAL CONTRACT DOCUMENTS

- A. The intent of the Electrical Contract Documents is to include all items and labor necessary for the proper execution and completion of the Work of the Electrical Trade Contractor. The Contract Documents of all Trades are complimentary to each other; what is required by one shall be as binding as if required by all. Performance of the Electrical Trade Contractor is required only to the extent consistent with the Project Contract Documents and reasonably inferable from them as being necessary to produce the desired results.
- B. It is expressly stipulated that neither the Drawings nor the Specifications shall take precedence over the other, and it is further stipulated that the Design Professional may interpret or construe the Drawings and Specifications so as to secure in all cases the result most consistent with the needs and requirements of the work. In the event of such ambiguity or discrepancy, comply with the higher cost product (material plus labor), the more stringent requirement, and supply the better quality or greater quantity of work.

1.4 PROPOSAL PREPARATION

- A. Prior to submitting a pricing quotation/proposal, proceed as follows, and include the following:
 - 1. Visit the site, survey, record, confirm and include in the scope of work, all material and labor necessary to install the equipment and systems indicated. Use the Contract Documents as diagrammatic in nature, since they are not intended to show all details which may affect the electrical bid proposal.
 - 2. Include the work, as applicable, to remove and dispose of conduit, wiring, light fixtures, devices, equipment and appurtenances, not required for new work, unless otherwise indicated to be abandoned in place.
 - 3. Include all disconnections, removals and temporary provisions required to permit rigging, installation, connection, testing and operation of the new equipment. Include all such provisions whether or not shown, detailed or specified within technical sections of the Contract Documents.
 - 4. Include in the work, the following:
 - a. One Project Manager;
 - b. One Project Foreman.
 - 5. Detail, layout, coordination and fit of all of electrical equipment. Plan all disconnections, removals, offsets, temporary provisions, as required, to fit the new equipment into the space, and as required to accommodate maintenance accessibility and service access.
 - 6. Maintain and submit for approval, a written project schedule, on a weekly basis.
 - 7. Organize, administrate, control and log the RFI process for their respective trade. Where applicable, submit all RFI(s) for master RFI log maintained by Lead/Prime Contractor.
- B. In preparing a Bid Price:
 - 1. Thoroughly review and confirm all existing conditions and Contract Document information. Make note in writing of any exceptions, misunderstandings, unclear

areas, unclear directions, and any aspects which will prohibit completion of the work, in total. Failing to supply such notice, all bidders will be accountable for having accepted all conditions at the site which affect their work and their costs. By submitting a bid price, all Trade Contractors certify that the Contract Documents have been thoroughly reviewed and are sufficient for construction, and that the bidding Trade Contractors have adequate information to establish and determine their responsibility for materials, methods, costs, and schedule for their work.

2. Incorporate all requirements of all sections of the Contract Documents.
3. Include the following with the Manufacturer's and Sub-Contractor's Lists:
 - a. The name and telephone number of all Sub-Contractors.
 - b. The manufacturer and model numbers of all equipment proposed by the bidder and as listed on all of the equipment schedules and specified in the Contract Documents.
 - c. Identify each subcontractor and manufacturer. Include reference to article number.

1.5 HAZARDOUS MATERIALS

- A. The use of asbestos, PCB's or any material or product containing hazardous materials in the performance of this contract is not permitted. Certify, in writing, that no hazardous material or product containing a hazardous material, has been furnished or installed.

1.6 DRAWINGS AND SPECIFICATIONS

- A. It is the intent of the specifications and drawings to include under each item all materials, apparatus and labor necessary to properly install, equip, adjust and put into perfect operation the respective portions of the installations specified and to so interconnect the various items or sections of the work as to form a complete and properly operating whole.
- B. Any apparatus, machinery, small items not mentioned in detail which are necessary to complete or perfect any portion of the installation in a substantial manner and in compliance with the requirements stated, implied or intended must be furnished and/or installed without extra cost to the Project. This includes all materials, devices or methods peculiar to the machinery, apparatus or systems furnished and/or installed by the Electrical Trade Contractor.
- C. In referring to drawings, figured dimensions take precedence over scale measurements. Verify all wall locations, ceiling heights, elevations, dimensions, etc. on the architectural drawings, where applicable. Discrepancies must be referred to the Design Professional for decision. Certify and verify all dimensions, routings and layouts in the field and on the coordination drawings before ordering material or commencing work.
- D. Any work called for in the specifications, but not mentioned or shown on the drawings, or called for on the drawings, but not mentioned in the specifications, must be furnished and/or installed as though called for in both.

- E. When any device or part of equipment is herein referred to in the singular number, such as "the pump" such reference is deemed to apply to as many such devices as required to complete the installation.
- F. The term "Provide" means "Furnish and Install". Neither term will be used generally in these specifications, but will be assumed. The term "Furnish" means to obtain and deliver to the job site for installation by other trades.

1.7 LAWS, ORDINANCES, REGULATIONS AND PERMITS

- A. The entire electrical system in all and/or in part must conform to all pertinent laws, ordinances and regulations of all bodies having jurisdiction, notwithstanding anything in these drawings or specifications to the contrary.
- B. Pay all fees and obtain and pay for all permits and inspections required by any authority having jurisdiction in connection with the work under this contract.
- C. Electrical work performed by the Electrical Trade Contractor must comply with the requirements of the National Electrical Code, NFPA and other boards and departments having local jurisdiction. Obtain and pay for all Electrical Inspections by local, municipal and state approving agencies. Inspections performed by the local inspector do not substitute for obtaining Independent Inspection by an authorized independent Electrical Inspection Agency.
 - 1. Qualifications: The EIA is to be an independent company from the Electrical Trade Contractor, registered with the State and a Master certified member of the International Association of Electrical Inspectors.
 - 2. Prepare and submit for review and comment to the Design Professional a schedule of inspections to be performed in coordination with the construction schedule.
 - 3. At a minimum, inspections shall be performed at the Rough-in, Progress and Final levels.
 - 4. The EIA shall submit written report for each level of inspection to the Design Professional to document compliance with current code requirements, including deficiencies and associated required remedial action.

1.8 TESTS

- A. The following requirements are supplementary to tests specified for individual equipment or systems in other specification sections. Give written notice of date of test in ample time to all concerned.
- B. Concealed or insulated work must remain uncovered until all required tests have been completed; but if construction schedule requires, arrange for partial tests on portions of systems as approved. If a Prime Contractor covers or directs a Sub-Contractor to cover electrical work prior to completing the required tests, the Prime Contractor is responsible for any additional costs related to completing the required tests.

- C. As soon as conditions permit, conduct preliminary tests of equipment to ascertain compliance with specified requirements. Make needed changes, adjustments and/or replacements as preliminary tests may indicate, prior to acceptance tests.
- D. Conduct pressure, performance and operating tests as specified or required for each system or piece of equipment installed, modified or affected under this contract in presence of the Design Professional or Owner as well as a representative of agencies having jurisdiction.
- E. Obtain Certificates of Approval and/or Acceptance as specified or required in compliance with regulations of agencies having jurisdiction. Work will not be deemed complete until such Certificates have been delivered to the Design Professional.
- F. Prove conclusively, by testing, that electrical systems operate properly, efficiently and quietly in accordance with intent of drawings, specifications and most widely used construction practices.

1.9 CLEANING

- A. Be responsible for the following:
 - 1. Removal of all lumber, refuse, metal, piping and debris from site resulting from electrical work.
 - 2. Cleaning drippings created by the electrical work, from finished work of other Trades.
 - 3. Cleaning, polishing, waxing of electrical work as required.
- B. After testing, and acceptance of all work by the Design Professional and the Owner, thoroughly clean all electrical equipment and material to the satisfaction of the Design Professional.

1.10 INSTRUCTING OWNER'S PERSONNEL

- A. After all tests and adjustments have been made, fully instruct the representatives of the Owner in all details of operation of the equipment installed under the Electrical Contract Documents.
- B. Operate electrical equipment for sufficient length of time to satisfy Design Professional that requirements of Contract Documents have been fulfilled.
- C. Prepare digital recording of each Owner training session on compact disc.

1.11 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide in accordance with Division 01.
- B. Submit digital format PDF of Operating and Maintenance Instructions to the Design Professional for review and processing.

- C. Upon completion of the Design Professional's review and processing of digital format PDF of the Operating and Maintenance Instructions, submit three (3) copies of the final version of the printed instructions to the Owner. Bind instructions in separate, hardback, 3-ring loose leaf binders.
- D. Prepare instruction books by sections and include detailed Operating and Maintenance Instructions for all components of all systems, including wiring, and piping diagrams necessary for clarity. Identify the covers with the name of the project and the words "Operating and Maintenance Instructions - ELECTRICAL".
- E. Each section must have labeled tabs and be clearly marked with equipment or system name and contain detailed parts list data, ordering information therefore and the name, address and telephone number of the closest supply source.
- F. All instructional data must be neatly and completely prepared to the satisfaction of the Design Professional.
- G. Provide complete copy of all warranties in separate tab with the binder.
- H. Provide copies of the as-built drawings in the manuals.
- I. Provide copy of each submittal for each piece of equipment on the project, complete with all tag numbers, Contractor's Transmittal Cover Sheet and Design Professional's final Submittal Review Sheet.
- J. Provide compact disc of Owner training sessions with the manuals.
- K. Provide complete copy of the Electrical System Commissioning Report.

1.12 GUARANTEE

- A. All material, equipment and workmanship must be in first class operating condition in every respect at time of acceptance by Owner. Acceptance by the Owner will be by letter written to the Electrical Trade Contractor.
- B. Unconditionally guarantee in writing all materials, equipment and workmanship for a period of one (1) year from date of acceptance by Owner. During the guarantee period, repair or replace, at the Electrical Trade Contractor's expense, any materials, equipment or workmanship in which defects may develop and provide free service for all equipment and systems involved in the contract during this guarantee period. Beneficial use of any system by any of the Trade Contractors during construction does not constitute acceptance by the Owner. Time period of this beneficial use cannot be included in the guarantee period.
- C. Guarantee must also include restoration to its original condition of all adjacent work that is disturbed in fulfilling this guarantee.
- D. All such repairs and/or replacements must be made without delay and at the convenience of the Owner.

- E. Guarantees furnished by Trade Contractors and/or equipment manufacturers must be counter-signed by the related Trade Contractor for joint and/or individual responsibility for subject item.
- F. Manufacturers' equipment guarantees or warranties extending beyond the guarantee period described in item B above must be transferred to the Owner along with the Trade Contractor's guarantees.

1.13 ENTRANCE OF EQUIPMENT

- A. Determine the method of equipment entrance during initial site visit prior to bidding. Do not scale building openings, door widths and equipment or component sizes off the drawings. Determine sizes from site measurements and the equipment manufacturer. Include cost of equipment manufacturer's knockdown, use of field assembled equipment, field assembly, all work required for access, removals, replacements, general construction, and the like, as required. During preparation of submittals, verify whether knocked-down or pre-disassembled equipment have been proposed all to the extent required to permit entry of equipment to final location. Verify that the use of field assembled (not pre-assembled) equipment complies with manufacturer's warranty, guarantee, listings and requirements.
- B. Perform all necessary rigging required for completion of electrical work.
- C. Deliver products to the site properly identified with names, model numbers, types, grades, compliance labels and other information needed for identification. Deliver products and equipment to the site properly weatherproofed.
- D. The Trade Contractor who furnishes or purchases the product or equipment is responsible to provide and maintain protection from the weather, dust, dirt, construction debris, etc. until the project is complete.
- E. For all products and equipment which, when installed, have an opening into the building must be provided with a plywood cover, or similar protection, to prevent debris, rain, etc. from entering the building. The Trade Contractor who installs the product or equipment is responsible for such protection beginning at the time of installation.

1.14 VISIT TO SITE

- A. Due to the nature of the work involved under these Contract Documents, all bidders are required to thoroughly examine the site. Coordinate and schedule all site visits with the Owner.
- B. Thoroughly review Contract Documents prior to visiting the site, take Contract Documents to site and thoroughly explore to any extent necessary, the existing conditions as relating to fulfilling the requirements of these Contract Documents.
- C. If discrepancies are noted between requirements of Contract Documents and existing conditions, Trade Contractors must so indicate to Design Professional during bidding period and receive clarification before bidding. Failure to comply with this requirement

will result in Design Professional's interpretation during the construction period such that the Design Professional's decision will be final and binding as the sole interpreter of the contract requirements.

- D. Extras will not be considered for any work relating to connections with existing systems or adaptability of new systems to existing structures.
- E. Submission of proposals will be considered evidence that Trade Contractors have complied with the requirements of this Article.

1.15 REQUESTS FOR INFORMATION, RFI(s)

- A. Manage RFI(s) in a formal manner. Preparation and submission must comply with the process specified herein to be of maximum benefit to the project. Prepare, manage, and maintain an RFI Log. RFI(s) which do not comply with this process will be returned without comment.
- B. All RFI(s):
 - 1. Must be submitted in written form to the party designated at the construction phase kick-off meeting;
 - 2. Must be consecutively numbered, dated, and logged as directed, during the kick-off meeting;
 - 3. Those which are follow-up RFI(s), must use the same RFI number, with a sequential submission number;
 - 4. Must list the RFI number of any reference RFI(s) used in the narrative;
 - 5. Must present: background; related drawings; specification articles; room, space locations (as designated on Contract Documents including wing, column line designation, floor designation, and/or north, south, and the like), and must be presented as complete, clearly written thoughts, in legibly printed or typed form;
 - 6. Must be completed by the Electrical Trade Contractor's Designated Project Foreman, under the control and overview of the Electrical Trade Contractor's Project Manager;
 - 7. Must include Electrical Trade Contractor's Project Foreman's suggested resolution to RFI;
 - 8. Must evidence a high level of fluency with the Contract Documents, all job progress correspondence, all Addenda, all Construction Bulletins, and specifically the Mechanical/Electrical Specifications including: all specifications.
- C. The Electrical Trade Contractor's designated Project Manager must demonstrate familiarity with and responsibility for all RFI(s) prepared by the Project Foreman and must periodically submit an initialed log of RFI(s) signifying control of RFI(s) relating to specification and job scope issues.
- D. Issues relating to job scope, work included, methods and means which are either clearly discernable from the Contract Documents and/or clearly the responsibility of the Electrical Trade Contractor must be answered by his Project Manager and resolved between the Foreman and Project Manager prior to resorting to written RFI(s). The work of the Project Manager must evidence: fluency with the methods and means anticipated by the

Electrical Trade Contractor during the bid phase to plan and complete the work; fluency with the Contract Documents, and all administrative issues related thereto.

- E. Items or issues which relate to non-compliance to associated codes or regulations must reference code interpretations or the published adopted code or regulation. The reference must be either an excerpt of the code or regulation, published addenda to the code or regulation, a formal interpretation written by a representative of the associated agency, or letter of non-compliance from the Authority Having Jurisdiction. All cited code requirements must include the applicable code title, code version or date, and code section number designation. If the RFI does not contain the required information, the RFI will be returned without comment.

1.16 AS-BUILT DRAWINGS

- A. Prepare reproducible (paper) and electronic (cd) record documents in AUTOCAD .dwg format (Version 2000 or later) in accordance with the requirements in Division 01. Use commercial CAD drafting service if Electrical Trade Contractor does not have CAD capabilities in-house. As an option, if requested by the Electrical Trade Contractor, an electronic copy (AutoCad .dwg format) of any of the Electrical Contract Drawings may be provided by the Design Professional at a cost of \$250.00, paid in advance, to the requesting Contractor. In addition to the requirements specified in Division 01, indicate the following installed conditions:
 - 1. Indicate actual inverts and horizontal locations of underground electrical transmission and distribution equipment, and the like.
 - 2. Equipment locations (exposed and concealed), dimensioned from prominent building lines and annotated with permanent equipment number approved by Owner. Include code and equipment service clearances.
 - 3. Approved substitutions, Addenda and Bulletin Contract Modifications, and actual equipment and materials installed.
- B. Engage the services of a Land Surveyor or Professional Engineer registered in the state in which the project is located, as specified in Division 01, to record the locations and invert elevations of the underground electrical work.

1.17 SERVICING OF EQUIPMENT AND SYSTEMS

- A. After work has been completed in accordance with the Contract Documents, and prior to final acceptance tests, each Trade Contractor must have manufacturers or their authorized agents of the equipment installed, completely check their equipment and put equipment into proper operation. In each case, the respective Trade Contractor must have the manufacturers thoroughly check the complete installation of the equipment, furnished by the manufacturer, for proper and correct operation under the service intended.
- B. Six months after final acceptance of the work under the Contract Documents, each of the Trade Contractors must have the manufacturers again check their equipment for proper operation and lubrication. Coincidentally, these Trade Contractors must assure that the Owner is properly instructed in the servicing of the equipment.

- C. Prior to expiration of the guarantee period, each Trade Contractor must check all equipment, materials and systems for which he is responsible, make necessary adjustments and/or replacements, and leave systems in first class operating condition.

1.18 SERVICING OF EQUIPMENT AND SYSTEMS (EXISTING/UNMODIFIED)

- A. Selected, designated existing electrical systems and equipment are planned to be continued in service upon project turnover, with no specified repair/modification covered under the Contract Documents. The Owner reserves the right to request repair/maintenance labor and materials, as an Owner requested change, depending on the results presented in the Electrical Trade Contractor's Evaluation Report.
- B. Perform inspection, evaluation, start-up and testing of the electrical systems and equipment listed below or as specified in Division 26, and prepare a full Electrical Evaluation Report listing: defects; deficiencies; required maintenance/repair labor and materials, all as required to restore unmodified systems and equipment to safe reliable code compliant use:
 - 1. Add systems here.
- C. Include within the Electrical Evaluation Report, a detailed breakdown of the proposed additional material and labor required to complete the recommended restoration(s).

1.19 CONTINUITY OF SERVICES

- A. Generally, no actions can be taken by the Electrical Trade Contractor that will interrupt any of the existing building services for these buildings or any other building until previously arranged and scheduled with the Design Professional and Owner.
- B. Should any service be interrupted by the Electrical Trade Contractor, immediately provide all labor, including overtime if necessary, and all material and equipment necessary for restoration of such service, at no additional cost to the Project.

1.20 CONTINUITY OF INTERIOR BUILDING SERVICE UTILITIES

- A. For the purposes of this specification section, "Building Service Utilities" include, but are not limited to:
 - 1. Exterior: electrical; domestic water; fire protection water; sanitary; storm; chilled water; space heating water; fuel lines; communication cable; fire alarm; remote metering lines; telemetry lines; and the like;
 - 2. Heating piping systems, complete;
 - 3. Chilled water piping systems, complete;
 - 4. Heating and process steam/condensate systems, complete;
 - 5. Ductwork systems, complete;
 - 6. Medical gas systems, complete;
 - 7. Fire protection systems, complete;
 - 8. Control systems, complete;

9. Plumbing, drainage and storm systems, complete;
 10. Process piping systems, complete;
 11. Electrical conduit and wiring systems, complete;
 12. Electrical lighting and wiring devices, complete;
 13. Electrical fire alarm and security systems, complete;
 14. Electrical communication systems, complete.
- B. Plan work and schedule to prevent interruption of all Utility System Services. Refer to the "Scope and Objectives of the Electrical Work," of this Section for a description of: unmodified systems, unmodified equipment; spaces wherein mechanical and electrical systems are unmodified; and Utility System Services external to the individual building or buildings addressed by the work of this project.
- C. Plan work and schedule installation and connections of all Utilities to minimize or prevent interruption of all Utility System Services. Refer to "General Requirements Electrical," Article "Scope and Objectives of the Electrical Work."
- D. The work required for continuity of these systems on this project includes, but is not limited to, providing all labor and material required for: site investigation/verification; disconnect; removal; rerouting; reconnection; as-built drawing documentation; testing and check out of mechanical and electrical services serving equipment which are implied to be, or specifically indicated to be, continued in operation.
- E. All materials required for relocation work must comply with these specifications. Carefully review all phasing drawings, all Construction Trade drawings, and complete all necessary and prudent site visits to become familiar with all existing building operations, systems and equipment which may be continued, independent of the work of this project, and include all required relocation work described in this section.

1.21 TEMPORARY FACILITIES, UTILITIES AND HEATING

- A. Refer to the general construction contract documents of these specifications.

1.22 SMOKE AND FIRESTOPPING (GENERAL)

- A. Furnish and install a material or a combination of materials to form an effective barrier against the spread of flame, smoke and gases, and to maintain the integrity of the "fire and/or smoke" rated construction. Refer to the general construction contract documents. Fire and smoke rated construction is identified on the general construction contract documents. Provide firestopping in the following locations:
1. Pipe and conduit penetrations through above grade floor slabs and through "fire and/or smoke"-rated partitions and fire walls.
 2. Penetrations of vertical shafts including, but not limited to pipe chases, duct chases, elevator shafts, and utility chutes.
 3. Other locations where indicated or required.
- B. Prepare submittals and submit for approval. Include manufacturer's descriptive data, typical details, installation instructions and the fire/smoke test data and/or report as

appropriate for the time rated construction and location. The fire/smoke test data must include a certification by a nationally recognized testing authority that the material has been tested in accordance with ASTM E 814, or UL 1479 fire tests.

- C. Deliver materials in the original unopened packages or containers showing name of the manufacturer and the brand name. Store materials off the ground, and protect from damage and exposure to elements. Damaged, deteriorated or outdated shelf life materials shall not be used and must be removed from the site.

1.23 COORDINATION DRAWINGS

- A. The HVAC Trade Contractor will initiate preparation of coordination drawings, control original reproducible, collect, organize and facilitate the work/input of General Contractor and all other building trades relative to the 100% final submission of the coordination drawings. Prepare coordination drawings in accordance with Division 1 to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Use proposed equipment submittals, which include certified dimensions, service clearances, etc., to prepare the coordination drawings. If equipment is submitted for review after completion of the coordination drawings and rejected during the submittal review process, because the equipment fails to meet the project specifications, the HVAC Trade Contractor is responsible to revise the coordination drawings and layout the work using equipment which meets the project specifications. HVAC Trade Contractor will designate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Proposed locations of conduit, pull boxes, equipment, and materials. Include the following:
 - a. Maximum physical separation to meet National Electrical Code requirements for feeder and secondary transformer tap lengths.
 - b. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
 - c. Equipment connections and support details.
 - d. Exterior wall and foundation penetrations.
 - e. Fire-rated wall and floor penetration.
 - f. Sizes and location of required concrete pads and bases.
 - 2. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
 - 3. Floor plans, elevations, and details to indicate penetrations in floors, walls and ceilings and their relationship to other penetrations and installations.
 - 4. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling mounted items.
 - 5. The foregoing information and coordination work must be provided by the applicable Trade Contractor using the coordination drawings as initiated by the HVAC Trade Contractor.

- 6. The HVAC Trade Contractor must submit completed coordination drawings for record purposes, not for technical review and approval, but as proof that the coordination drawings have been completed. The coordination drawings must be completed and submitted for record in advance of submission of sheet metal shop drawings.
- B. Coordinate with, and provide to the HVAC Trade Contractor, all electrical system and equipment information, locations and clearances required to prepare the coordination drawings.

1.24 TRADE CONTRACTOR'S CERTIFICATION

- A. Upon final completion of all work, each Trade Contractor must provide a notarized letter on Corporate letterhead, executed by a Corporate Officer, or Company Partner, stating that the work has been completed in accordance with the Contract Documents, Addenda, Bulletins, Trade Contractor's Punch List items and Design Professional's Construction Observation Report(s). Final Payment will not be approved until the notarized letter has been provided. Refer to the following sample letter.

SAMPLE LETTER

ENGINEER/ARCHITECT _____

TRADE CONTRACTOR _____

PROJECT _____ NO. _____

I hereby certify that all work under the HVAC, Plumbing, Fire Protection and Electrical Contract Documents, as applicable, including all addenda, bulletins, Punch List items and Construction Observation Reports, has been completed and the quality and workmanship of the work has been performed in accordance with Contract Documents.

State of: _____

County of: _____

Trade Contractor:

Subscribed and Sworn to before
me this _____ day of
20 _____

Notary Public:

By: _____

My Commission Expires:

Date: _____



PART 2 - PRODUCTS

2.1 MANUFACTURER'S AND SUB-CONTRACTORS LIST, KEYMEN RESUMES

- A. Before ordering any material or equipment unit, and not later than ten (10) working days after signing of contracts, submit a list of Manufacturers, Sub-Contractors and Suppliers showing make, type, manufacturer's name and trade designation of all materials, and equipment, proposed for use under this contract. Prepare list by reference to specifications. Identify all long lead submittals which will require an expedited submittal review.
- B. Refer to the Article "Proposal Preparation," in this section. Specifically designate the labor force required of the Electrical Trade Contractor. As part of the mobilization phase of the work, submit resumes for each Keyman including the Project Manager and Project Foreman.
- C. These lists, when approved, will be supplementary to specifications, and no variations therefrom will be permitted except with the approval of the Design Professional.
- D. Prepare the list using the "PROPOSED MANUFACTURERS AND SUB-CONTRACTORS LIST" located at the end of this section.
- E. Submittals will not be processed until the requirements of this Article are satisfactorily completed.

2.2 SUBMITTALS

- A. Provide digital submissions (.pdf format) for all material and equipment as noted in Proposed Manufacturer's and Sub-Contractors List, except where indicated otherwise herein.
 - 1. Prior to submission of product data, shop drawings, and samples, notify the Design Professional of any site conditions differing from those indicated or specified.
 - 2. Prior to submission of product data, shop drawings and samples to the design professional, the HVAC Trade Contractor, the Plumbing Trade Contractor and the Fire Protection Trade Contractor shall submit all submittals which require electrical power to the Project Electrical Trade Contractor for the HVAC Trade Contractor's, the Plumbing Trade Contractor's, the Fire Protection Trade Contractor's and the Electrical Trade Contractor's coordination and review. The Electrical Trade Contractor shall provide approval of electrical power requirements for the HVAC, Plumbing and Fire Protection Trade Contractors' proposed equipment.
 - 3. All submittals of equipment requiring electrical power must be accompanied by the "HVAC AND ELECTRICAL CONTRACTORS' COORDINATION OF HVAC EQUIPMENT ELECTRICAL REQUIREMENTS TRANSMITTAL COVER SHEET", the "PLUMBING AND ELECTRICAL CONTRACTORS' COORDINATION OF PLUMBING EQUIPMENT ELECTRICAL REQUIREMENTS TRANSMITTAL COVER SHEET" and the "FIRE PROTECTION AND ELECTRICAL CONTRACTORS' COORDINATION OF FIRE PROTECTION EQUIPMENT ELECTRICAL REQUIREMENTS TRANSMITTAL COVER SHEET", as applicable, all located at the

- end of this section. Submittals without this Cover Sheet or an incomplete Cover Sheet will be rejected without review.
4. All submittals must be accompanied by the "ELECTRICAL CONTRACTOR'S TRANSMITTAL COVER SHEET" located at the end of this section. Submittals without this cover sheet or with an incomplete cover sheet, will be rejected without review.
 5. All submittals must be accompanied by the "ELECTRICAL SUBMITTAL LOG", located at the end of this section. Submit log after final acceptance of the proposed Manufacturer's and Sub-Contractor's list. Revise and update the log with each submittal. Submittals without these logs or without an updated log will be rejected without review.
 6. Specifically annotate and sign all exceptions, deletions and additions that vary from the Project Contract Documents. Failing to provide signed annotations for all deletions and additions, recognize and accept that Contract Documents will govern, and will be used to resolve disputes.
- B. Prepare submittals by careful reference to: drawings and specifications; preparatory layout of all work; coordination with all proposed equipment; coordination with related submittals and the work of all other Trade Contractors; space requirements; and Utilities defined in this Section. A review of such submittals by the Design Professional, which include drawings, schedules, and catalog cuts provided by the Trade Contractors, their Sub-Contractors, manufacturers, and vendors, shall not relieve the Trade Contractors from the responsibility for correcting all errors of any sort in the submittals, either identified or undetected by such review.
- C. Regularly provide and update submittal log sheets listing submittal number, product, applicable specification section, dates of submittal and receipt and status. Identify each submittal by Job Name, log number and reference to applicable Specification Article number.
- D. All equipment submittals must include, but not be limited to, the following:
1. Manufacturers' catalog designation, photographs and specifications.
 2. Full electrical data, including specifically, electrical characteristics.
 3. Full General Construction data, including operating weights, dimensional data including service access space. Data shall be given to the General Construction Trade Contractor, where applicable, for use in setting steel, supports, and attachments.
 4. Full wiring diagrams, including clearly identified power connections and control connections. Data and diagrams shall be given to the Automatic Temperature Control (ATC) Trade Sub-Contractor for their use and inclusion into their submittals.
 5. Listing of specific electrical performance, calculations and data.
 6. Dimensions, capacities, ratings, material and finish.
 7. Complete the submittal by listing all available options, accessories, configurations and materials, and legibly strike out with single thin line all proposed deletions. Clearly signify whether each and every manufacturer's option, accessory, configuration and material choice is included and which is excluded by the submission.
 8. Annotation of equipment, devices, systems as indicated by the Contract Documents (PNL-1, etc.).

9. Certification of testing by agencies such as ETL, ARI, UL, etc.
10. Such other detailed information as required for proper evaluation.

E. Review Time:

1. Allow two (2) weeks after Design Professional's receipt for the Design Professional's processing of each submittal, exclusive of Owner's, or other's review in the processing chain. Allow a longer time period where processing must be delayed for coordination with subsequent submittals.

F. Submittals for electric motor starters must include a tabulation listing the following:

1. The equipment the starter is intended to control.
2. Horsepower and starter size.
3. Voltage.
4. Phase.
5. Full load amperes.
6. The manufacturer's number or type.
7. Heater numbers and amperage.
8. Quantity of auxiliary contacts required by ATC and fire alarm systems.
9. Pushbutton arrangement.
10. Pilot light arrangement if applicable.

G. Submittals for automatic temperature controls must be coordinated with: 1) all electrical equipment manufacturers' and vendors' submittals including review of electrical submittals by ATC Sub-Contractor for conformance with sequences of operation for each piece of equipment; 2) all electrical requirements of ATC System with Electrical Trade Contractor; and 3) all fire and safety requirements of the Fire Alarm System. ATC submittals shall include copies of all wiring diagrams for all electrical equipment with points of connections clearly identified. ATC submittals shall not be developed and submitted until Electrical Trade Contractor provides all equipment submittals for review.

H. The Design Professional's recommendation of acceptance of the equipment proposed by the Electrical Trade Contractor is conditional upon the Electrical Trade Contractor fulfilling all obligations of the Contract Documents. By furnishing the proposed equipment, the Electrical Trade Contractor acknowledges compliance with all of the following:

1. Field layout is completed and planning of proposed equipment has coordinated with all related submittals, related trades and space requirements.
2. The Electrical Trade Contractor has reviewed and approved all submittals prior to submission. Provide all submittals with a signed approval stamp, signifying the following: 1) all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data have been verified; 2) the Design Professional has been notified of all site conditions which affect the work, and which require design resolution, as opposed to resolution by trade decisions; 3) all items are approved by the Electrical Trade Contractor, and have been coordinated and checked with other applicable submittals, and contract requirements; 4) submission is clearly marked to indicate which manufacturer's options are provided and which are not provided for the proposed equipment; and 5) manufacturers and/or equipment suppliers have

been given a set of the contract documents for their review and use as the basis of the submittals.

3. Any and all exceptions requested by the Electrical Trade Contractor are provided in writing with the submittals. All exceptions, deletions and additions that vary from the Contract Documents have been specifically annotated and initialed. Failing to provide initialed annotations for all deletions and additions, the Electrical Trade Contractor accepts the condition that the Contract Documents will govern, and will be used to resolve disputes.
 4. Submittals without the Electrical Trade Contractor's signed stamp of approval will be returned without review. Initialed approval stamps are not acceptable.
 5. The Design Professional's acceptance of the proposed equipment constitutes the Engineer's formal approval that the engineering performance and operational utility requirements, of the proposed equipment, match the Design Professional's specified and designed performance requirements. By entering into these Contracts, the Trade Contractors agree that the purpose of submittals is to demonstrate to the Design Professional that the Trade Contractors understand the design concept and that they demonstrate their understanding by indicating which materials and equipment they intend to furnish, install and use.
- I. Secure submittals smaller than 8-1/2 x 11 to paper of this size.
 - J. Material and equipment fabricated, furnished and/or installed or used without the Design Professional's review are subject to rejection by the Design Professional.
 - K. Corrections or comments made on submittals during review by the Design Professional do not relieve the Electrical Trade Contractor from compliance with the requirements of the Contract Documents. Such review will be only for general conformance with the design concept, and the information given in the Contract Documents and does not include review of quantities, dimensions, sizing, pressure drops, weights or gauges, fabrication processes, construction methods, coordination with the work of other trades, or construction safety precautions, all of which are the sole responsibility of the Electrical Trade Contractor. Review of a specific item does not indicate acceptance of an assembly of which the item is a component. The Design Professional is not responsible for any deviations from the Contract Documents that are not clearly noted by the Electrical Trade Contractor. The Design Professional will not review partial submissions or those for which submissions for correlated items have not been received. The Electrical Trade Contractor is responsible for: confirming and correlating all quantities, clearance, and dimensions; selecting fabrication processes and techniques of construction; coordinating work with all other Trades, and performing his work in a safe and satisfactory manner.
 - L. All submittals must be able to be reproduced. The Electrical Trade Contractor is responsible for all reproduction and distribution to the General Construction Trade Contractor and all other Trade Contractors as applicable.
 - M. If requested for the Electrical Trade Contractor's use in the preparation of submittals, an electronic copy (AutoCad .dwg format) of any of the Electrical Contract Drawings may be provided by the Design Professional, after receipt of a signed indemnification agreement, at a cost of \$250.00, paid in advance, by the Electrical Trade Contractor.

- N. For additional requirements regarding submittals, refer to Article “Additional Trade Contractor Paid fees and Expenses” in Part 3 of this section.

2.3 MATERIALS AND EQUIPMENT

- A. All materials and equipment must be new and conform to the grade, quality and standards specified herein.
- B. All equipment offered under these specifications is limited to products regularly produced and recommended for service ratings in accordance with engineering data or other comprehensive literature made available to the public and in effect at the time of opening of bids. Testing agency seals, decals and/or nameplate shall be attached to and visible on all equipment.
- C. Items such as valves, motors, starting equipment, vibration isolating devices, and all other equipment and material, where applicable and practicable, must each be of one manufacturer.
- D. Install equipment in strict accordance with manufacturer’s instructions for type and capacity of each piece of equipment used. Obtain these instructions, which will be considered part of these specifications. Type, capacity and application of equipment must be suitable and operate satisfactorily for the purpose intended in the electrical systems.

2.4 EQUIPMENT VARIATIONS AND SUBSTITUTIONS

- A. Equipment Substitution Definition as follows:
 - 1. A product that is neither the Basis of Design, nor one of the named Alternative Manufacturing Sources.
 - 2. Unless noted otherwise in the Contract Documents, substitutions may be considered after the award of Contracts. Subsequent requests will be considered only when, through no fault of the Electrical Trade Contractor, none of the specified products are available.
- B. Equipment Variation Definition as follows:
 - 1. A product that is not the Basis of Design, but is named as one of the specified Alternative Manufacturing Sources.
- C. The manufacturers listed in Part 2 of all technical specifications are considered Alternative Manufacturing Sources as described in Paragraphs A and B above.
- D. “Subject to compliance”, as used in these specifications, means compliance with all the requirements of the Contract Documents.
- E. The materials and products mentioned in these Contract Documents are specified to establish a standard of: material of manufacture; independent testing agency certifications; quality; function; design; and performance. The phrases “Basis of Design,” “standard of design,” and “equivalent acceptable,” are used to indicate that other similar, comparable

products may be used provided such substitutes or variations are accepted by the Design Professional as meeting all the salient characteristics and standards necessary, such as: material of manufacture; independent testing agency certifications; quality; function; design; and performance, to meet the Owner's needs and meet the objectives of the Design Professional's Project Design.

- F. Where Alternative Manufacturing Sources are listed for an item:
1. Selection must be either the Basis of Design or one of those listed Alternative Manufacturing Sources.
 2. There is no guarantee implied that each and every manufacturer listed can meet or exceed the salient characteristics, such as: material of manufacture; independent testing agency certifications; quality; function; design; and performance of the product specified as Basis of Design.
- G. Each Trade Contractor is responsible to contact each proposed equipment manufacturer's representative and confirm, prior to preparing submittals, the proposed manufacturer's product meets or exceeds the: material of manufacture; independent testing agency certifications; quality; function; design; and performance of the product specified as the Basis of Design. Final acceptance will be determined by the Design Professional, whose decision is final.
- H. Submittals offered as an Equipment Variation from the Basis of Design shall include a letter, on the product manufacturer's letterhead, certifying that the proposed product is a Comparable Product to the product specified as the Basis of Design and conforms to all the salient characteristics, including: material of manufacture; quality; function; design; and performance of the product specified as the Basis of Design. If directed by the Design Professional for Products offered as an Equipment Variation, the Offerer shall provide a Letter of Confirmation from a Registered, Professional Engineer attesting that the Proposed Equipment Variation conforms to all the salient characteristics, including: material of manufacture; independent testing agency certifications; quality; function; design; and performance of the product specified as the Basis of Design.
- I. Specific products specified without use of the term: equal; equivalent; comparable product; substitution; or similar term; constitute a proprietary specification, and must be provided as specified, unless a written request is submitted to the Engineer for approval up to ten (10) days after the date of project award. Such requests must include a complete description of the proposed product, along with sufficient documentation and other information necessary for a complete evaluation of the proposed product. Such Trade Contractor Requests shall include a letter, on the product manufacturer's letterhead, certifying that the proposed product is a Comparable Product and conforms to all the salient characteristics, including: material of manufacture; independent testing agency certifications; quality; function, design; and performance of the specified product. If approved, the proposed product will be listed in an addendum to notify all bidders that such acceptance has been granted by the Design Professional. If not approved, provide the specified product.
- J. Provide Calculations, signed and sealed by a Professional Engineer registered in the State in which the work is taking place, engaged by the Electrical Trade Contractor, confirming that the equipment proposed as either a Substitution, or Variation, is a Comparable

Product to the product specified as the Basis of Design and conforms to all the salient characteristics, including: material of manufacturer; independent testing agency certifications; quality; function; design; and performance of the product specified as the Basis of Design. Provide such calculations for major pieces of equipment (emergency generators, switchgear, transformers, etc.). The Design Professional, whose decision will be final, will determine which products will require calculations during the submittal review process.

- K. The Contract Documents have been founded upon Engineering Design selection of materials, products, and pieces of equipment listed at the Basis of Design. In the event that the incorporation of an approved Substitution, Variation, or assembly, into the work, requires revisions or additions to the contractual requirements of either the Trade Contractor proposing the substitution or variation, or any other Trade Contractor, the Trade Contractor proposing the substitution or variation, shall bear the cost of: such revisions or additions to the work of the Trade Contractor proposing such Substitution and/or Variation; any expenses of all affected trades; and all engineering or architectural services required at no change in the contract sum.
- L. The equipment specifications indicated on the drawings, or in Part 2 of each of the technical specifications, may or may not indicate or include all of the required salient characteristics, components and accessories included with the specified product. Include cost for all such characteristics, components and accessories required to meet or exceed the: material of manufacture; independent testing agency certifications; quality; function; design; and performance of the product specified as the Basis of Design.
- M. For requirements regarding equipment variations after bid award, refer to Article "Additional Trade Contractor Paid Fees and Expenses" in Part 3 of this section.
- N. Each Trade Contractor negotiating for pricing advantages affecting the Trade Contractor's Bid shall comply with the directives included herein, bear full responsibility for the accuracy and completeness of the submissions required of the Vendor selected by the Trade Contractor. The Proposing Trade Contractor shall bear full responsibility for all extra costs of the Design Professional shown to have resulted from inaccurate, and/or incomplete compliance with the directives included in this Specification Article.
- O. All decisions provided by the Design Professional, described herein, shall be final.

2.5 VIBRATION ELIMINATION

- A. Provide vibration isolation support provisions for all moving or rotating equipment, machinery and transformers when such provisions are not furnished and/or integrally mounted by the equipment manufacturers. Install in accordance with vibration isolation manufacturer's recommendations unless specified otherwise herein.
- B. Subject to compliance with the requirements, provide products by one of the following:
 - 1. Amber/Booth Company;
 - 2. Korfund Company, Inc.;
 - 3. Mason Industries.

- 4. Or approved equal in accordance with the project substitution provisions of the contract.
- C. Provide all rotating or moving machinery or equipment mounted on, or suspended from, building structure with approved resilient suspension isolation mountings.
- D. Provide vibration isolating connections between all pumps and connecting piping. Length, size, and stiffness as recommended by vibration isolator manufacturer.
- E. Use flexible metallic conduit for all electrical connections to moving or vibrating equipment, such as motors, generators, transformers, and the like.
- F. Rigid pipes, conduit or other extended machine assemblies connected to vibration isolated equipment are not permitted to be tied in directly with the building construction. Connect such elements to the equipment through flexible fittings, and support using isolating equipment as required.
- G. All systems must operate free from objectionable vibration and noise. Take all necessary steps required to achieve this result without additional cost to the Project.

2.6 NOISE CONTROL

- A. Noise levels in all 8 octave bands due to equipment and systems shall not exceed NC 35 within the occupied room, except as follows:

<u>TYPE OF ROOM</u>	<u>NC LEVEL</u>
Audio Suites, Audio Speech Pathology, Phono/Cardiology	25
Operating Rooms	40
Offices, large open	40
Lobbies, Waiting Areas	40
Corridors	40
Bath Rooms and Toilet Rooms	40
Laboratories	45
SPD, Dining Rooms, Food Service/Serving, Therapeutic Pools	45
Kitchens, Locker Rooms, Warehouses, Shop, Laundries, Gymnasiums, Recreation Rooms	50
X-Ray & General Work Rooms	40

- B. For equipment which has no sound power ratings scheduled on the plans, select equipment such that the fore-going noise criteria, local ordinance noise levels, and OSHA requirements are not exceeded. Selection procedure shall be in accordance with ASHRAE 2015 HVAC Applications Handbook, Chapter 48, NOISE AND VIBRATION CONTROL.
- C. An allowance, not to exceed 5db, may be added to the measured value to compensate for the variation of the room attenuating effect between room test condition prior to occupancy and design condition after occupancy which may include the addition of sound absorbing material, such as, furniture. This allowance may not be taken after occupancy. The room attenuating effect is defined as the difference between sound power level emitted to room and sound pressure level in room.

- D. In absence of specified measurement requirements, measure equipment noise levels three feet from equipment and at an elevation of maximum noise generation.
- E. If sound levels are exceeded, provide sound reducing devices, including, but not limited to: sound attenuators; acoustic enclosures; additional equipment insulation or vibration isolators to conform to these specifications. Provide required material and labor at no additional cost to the project.

2.7 INSERTS, HANGER SUPPORTS, CLAMPS, FASTENINGS

- A. All materials, designs and types of inserts, hanger supports and clamps must meet the requirements of the latest edition of the Manufacturers Standardization Society Document MSS-SP-58, Underwriters Laboratories, Inc., National Electrical Code and Factory Mutual Engineering Division Standards where applicable. Insert, hanger support and clamp types referenced herein are shown in MSS-SP-58.
- B. Provide all necessary inserts, hanger supports, fastenings, clamps and attachments necessary for support of the electrical work. Select the types of all inserts, hanger supports, fastenings, clamps and attachments to suit both new and existing building construction conditions specifically for the purposes intended.
- C. In new overhead cast-in-place concrete construction, provide type 19 steel concrete inserts and fasten to form work before concrete is cast. For cast concrete floor or roof sections too thin to permit the use of inserts, extend the hanger rod through the slab and terminate with a nut and large washer, recessed into the top face of the slab as approved by the Design Professional.
- D. Clamps and attachments to steel beams and bar joists must be made using types 20, 21, 23, 25, 27, 28, 29 or 30 as applicable to suit conditions of construction. Clamps and attachments must be selected on the basis of the required load to be supported. Provide all necessary steel angle iron or channel between bar joists, or steel beams where direct attachment cannot be made. Holes are not permitted to be drilled or burned in structural building steel for hanger rod supports. Welding of hangers or supports to structural steel is prohibited unless approved beforehand by a Structural Engineer.
- E. Metallic masonry anchors may be provided for all pre-cast concrete, masonry and cast concrete construction as an alternate to item (C) above. Locate in pre-cast and cast-in-place concrete as directed by the Structural Engineer. Select and install as recommended by the anchor manufacturer for the various applications, stresses and services involved. Accomplish installation of masonry anchors by pre-drilling concrete or masonry to diameters and depths required to properly accommodate anchor bolts.
- F. Subject to compliance with the requirements, provide products by one of the following:
 - 1. Dynabolt;
 - 2. Ram-In;
 - 3. Tru-Bolt manufactured by Ramset;
 - 4. Redhead;
 - 5. Hilti;
 - 6. Wej-It.

7. Or approved equal in accordance with the project substitution provisions of the contract.
- G. Toggle bolts may be used in dry wall and lath and block plaster walls. The use of toggle bolts is restricted to the weight limitations imposed by the toggle bolt manufacturer for the size used.
- H. Except where noted otherwise herein, attachment to wood or material of similar fibrous nature must be made with lag screws and/or wood screws of required size.
- I. Screws with wooden or plastic plugs, or lead anchors are not acceptable.

2.8 ACCESS DOORS AND PANELS

- A. For projects which include the work of a General Construction Trade Contractor, furnish and locate for installation under General Construction, all access doors and panels for concealed portions of electrical work requiring accessibility for operation and maintenance. If project does not include a General Construction Trade Contractor, provide access doors as required.
- B. Access doors and panels may not be installed without specific approval of the Design Professional as to location. The proposed location of access doors and panels must be reviewed with the Design Professional and the General Construction Trade Foreman, where applicable, and the locations indicated on the coordination drawings prior to installation of equipment, access doors or panels. Controversies must be resolved at no cost to the Project.
- C. Minimum size of 24" x 18" unless shown, specified or approved otherwise.
- D. Sixteen (16) gauge minimum construction with concealed spring hinges, screw fasteners and painted finish. Color by Architect.
- E. Subject to compliance with the requirements, provide products by one of the following:
 1. Milcor.
 2. Karp.
 3. Mifab.
 4. Or approved equal in accordance with the project substitution provisions of the contract.
- F. For access doors in drywall, provide drywall bead flange.
- G. For access doors in hard plaster or ceramic tile, provide expanded metal casing bead.
- H. For access doors in unplastered masonry and concrete, provide one piece frame for flush mounting.
- I. For access doors in acoustic tile ceilings, provide recessed door panel with room to receive acoustic tile.

- J. Underwriters "B" label access doors where required for access to shafts, corridors, and where located in fire walls and partitions.

2.9 EQUIPMENT ANCHOR BOLTS

- A. Provide and set in place at the time concrete foundations, bases or curbs are poured or formed, all necessary anchor bolts as required for the various equipment specified herein, with hook type anchor bolts of proper size and length to suit the apparatus as recommended by the equipment manufacturer. Set bolts in pipe sleeves of approximately twice the bolt diameter and of length equal to the embedded length of the bolt, with sleeves terminating flush with finished surfaces of foundations, bases or curbs.
- B. When the equipment is set in its proper position and aligned with the anchor bolts, the space between the anchor bolts and the inside wall of the sleeves must be completely filled with non-shrink cementitious grout.
- C. Subject to compliance with the requirements, provide products by one of the following:
 - 1. Crystex as manufactured by L & M Construction Chemicals, Inc.;
 - 2. Master Builders;
 - 3. BASF.
 - 4. Or approved equal in accordance with the project substitution provisions of the contract.
- D. When a General Construction Trade Contractor provides concrete foundations, bases or curbs, the Electrical Trade Contractor is responsible for all anchor bolts required by the equipment he provides, under the Contract Documents. Assign a supervisory representative to be present at the time foundations, bases or curbs are poured or formed. For projects wherein there is no General Construction Trade Contractor, the Electrical Trade Contractor is responsible for pouring, locating, and setting equipment foundations, bases and curbs and the location of anchor bolts for the equipment provided or installed by him on this Project.
- E. All anchor bolts must be of sufficient strength to withstand any loading imposed by the attached materials or equipment.

2.10 PIPING AND CONDUIT SLEEVES

- A. Provide all sleeves required for electrical work and be fully responsible for the final and permanent locations thereof.
- B. Provide sleeves in the following locations:
 - 1. All pipes and conduits passing through all cast-in-place concrete construction and masonry walls.
 - 2. All pipes and conduits passing through cast-in-place waterproof concrete construction and waterproof masonry walls.

- C. Extend through construction and finish flush with each surface except where noted otherwise. Provide for a minimum 1/2" clearance around conduit, pipe or its covering in the instance of pipe covered with insulation.
- D. All sleeves in waterproof walls and floors must be fitted and sealed with positive hydrostatic mechanical seals. Sleeves must be sized accordingly. Mechanical seals must be placed around piping and/or conduit and inserted into void between inner wall of sleeve and piping and/or conduit. Tighten mechanical seals as required for watertight seal.
- E. Subject to compliance with the requirements, provide products by one of the following:
 - 1. "Link Seal" as manufactured by Thunderline Corporation;
 - 2. Advance Products and Systems, Inc.;
 - 3. Proco Products, Inc.
 - 4. Or approved equal in accordance with the project substitution provisions of the contract.
- F. All sleeves must be Schedule 40 steel pipe finished with smooth edges. Sleeves in waterproof walls and floors must be fabricated with minimum 1/4" thick rectangular steel plate placed around mid-point of sleeve, continuously welded to sleeve and then place the entire/plate assembly into proper position prior to erection of walls and floors. Otherwise, provide sleeves with a minimum of three (3) lugs for anchoring.
- G. Pack voids between sleeves, piping or conduit, where located in fire or smoke rated assemblies, in accordance with UL Fire Resistance Directory.
- H. Set all sleeves prior to or during erection of walls and floors. In the event that sleeves are omitted or incorrectly located in new walls or slabs, submit a location plan and method of cutting and installing sleeves to the Design Professional for review prior to carrying out the work.
- I. If sleeves are omitted or located incorrectly, the particular Trade Contractor who is at fault, at no additional cost to the project, must engage the trade which originally installed the work, to cut and patch to the satisfaction of the Design Professional.
- J. Provide mechanical seals and insert into voids between piping and conduits that pass through floors, and which will be exposed in finished areas that have floor drains, including spaces classified as "Janitors Closets," "Toilet Rooms," and the like.
- K. Where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine, such as a masonry saw or core drill, to insure a neat hole.

2.11 SMOKE/FIRESTOPPING (MATERIALS)

- A. Firestopping materials and systems must consist of commercially manufactured products complying with the following minimum requirements and be asbestos and PCB free:
 - 1. Flame Spread Index: Twenty-five or less when tested in accordance with ASTM E 84.

2. Smoke Density Index: Fifty or less when tested in accordance with ASTM E 84.
3. Nontoxicity: Nontoxic to human beings at all stages of application and during fire conditions.
4. Systems shall comply with Underwriter's Laboratory Listing Requirements.
5. Fire Resistance:
 - a. Materials and systems used to seal penetrations in time rated assemblies must be capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 time temperature fire conditions for 3 hours.
 - b. Materials must not require a rise in temperature to install or activate seal.
 - c. Materials must not contain solvents or require hazardous waste disposal.
 - d. Firestop material must not dissolve in water after curing.

B. Subject to compliance with the requirements, provide products by one of the following:

1. Rectorshield, Inc.;
2. Hilti;
3. 3M.
4. Or approved equal in accordance with the project substitution provisions of the contract.

C. Refer to general construction contract documents of these specifications.

D. Smoke stopping materials must be approved by the authority having jurisdiction.

2.12 FIRE/SMOKE DAMPERS, SMOKE DETECTORS/SMOKE DETECTOR CONTROL

A. All fire/smoke dampers for the project will be provided by the HVAC Trade Contractor.

B. Refer to the general construction contract documents, where applicable, for locations and classification ratings for all smoke and fire rated walls, floors and assemblies, new and existing.

C. Duct mounted smoke detectors will be used to activate smoke dampers unless area detectors are used to activate smoke damper. Tie detectors into the building's fire alarm system. HVAC Trade Contractor will tie detectors into the Building Automation System (BAS) where applicable.

D. Electrical Trade Contractor shall provide area smoke detectors for operation of smoke dampers as applicable and specified. Electrical Trade Contractor shall connect, then test and check-out smoke detectors connected to the building's fire alarm system as specified. Electrical Trade Contractor to check-out smoke detectors tied into the Building Automation System.

E. All new duct mounted smoke detectors shall be furnished by the Electrical Trade Contractor and installed by the HVAC Trade Contractor, and shall be installed generally as located on the HVAC drawings.

- F. Connections for automatic shutdown of air handling units shall be provided by the HVAC Trade Contractor, in compliance with the ATC Section of these specifications. Connections for fire alarm system shall be provided by the Electrical Trade Contractor.
- G. HVAC Trade Contractor shall clearly indicate location of all new smoke detectors required in ductwork on sheet metal shop drawing submissions.
- H. Smoke evacuation system control and actuation shall be provided by the HVAC Trade Contractor, with detection and signal for the fire alarm system provided by the Electrical Trade Contractor.
- I. Area actuation signals and connections for smoke dampers shall be provided by the Electrical Trade Contractor. Locate signal where visible to Building Personnel.

PART 3 - EXECUTION

3.1 METHOD OF PROCEDURE

- A. The drawings accompanying these specifications are diagrammatic and intended to cover the approximate and relative locations of the building systems.
- B. Installation, connection and interconnection of all components of these systems must be complete and made in accordance with the manufacturers' instructions and best trade practices.
- C. Erect all parts of equipment furnished at such time and in such manner as not to delay or interfere with other Trade Contractors and their work.
- D. Plug all piping, conduit and ductwork as required during construction to prevent entering of dirt.
- E. Before material is ordered or fabricated, or any work is performed, verify all calculations, sizing, measurements, including lines, grades, pipes, and conduit elevations at the building, as applicable, and be responsible for the correctness thereof. No extra compensation will be allowed on account of differences between actual dimensions, routing and measurements and those indicated in the Contract Documents. Any discrepancies discovered must be submitted to the Engineer for consideration before proceeding with the work.
- F. Lay out work and be responsible for the establishment of heights, grades, and the like, for all interior and exterior equipment and systems as applicable, including piping, drains, fixtures, conduit, and the like, included in Contract Documents, in strict accordance with the intent expressed thereby; and all the physical conditions to be met at the building and finished grade, and be responsible for accuracy thereof. The establishment of the location of all work must be performed in consideration of the finished work. In case of conflict, equipment and/or materials must be relocated without cost to the Project, as directed by the Design Professional, regardless of which equipment was installed first. Refer to Article, "Coordination Drawings", in Part 1 of this section.

- G. Cooperate with other Trade Contractors for the proper securing and anchoring of all work included within these specifications. Use extraordinary care in the erection and installation of all equipment and materials to avoid marring surfaces of the work of other Trade Contractors, as each Trade Contractor will be held financially responsible for all such injury caused by the lack of precaution and due to negligence on the part of the Trade Contractor's work force.
- H. Do not run pipe or conduit in any concrete slab three inches (3") or less in thickness. Do not place any pipe or conduit in any slab where the outside diameter of the pipe or conduit is more than one-quarter the thickness of the slab. The sweep of pipe or conduit elbows emerging through concrete slabs must not create any hazard or obstructions.
- I. All piping, conduit and other materials and equipment shown to be mounted below ceilings are to be kept as close to ceiling areas as possible unless otherwise noted.
- J. Install and arrange all equipment, such as junction boxes, and the like, which will be concealed in construction, to be fully accessible for adjustment, service and maintenance. Furnish access doors where required for installation under the General Construction Contract, where applicable. Otherwise, furnish and install all required access doors.

3.2 PROTECTION OF WORK

- A. Provide all piping, equipment, materials and accessories having polished or plated surfaces, machined finishes or unpainted surfaces with a thick coat of a neutral protection grease and carefully cover with thick cloth or heavy building paper held securely in place to protect the finish against damage during the entire period of construction. Protect equipment by the use of canvas tarps, vinyl sheeting or similar materials held securely in place.
- B. Seal all openings in pipes, fittings, conduit and all other materials to exclude dirt, sand, and other foreign materials.
- C. Exercise every precaution to exclude dust, dirt and all other foreign materials from switchgear rooms, transformers, and all mechanical equipment rooms during construction. Rooms and equipment contained therein must be swept and vacuum cleaned at regular intervals. All relays, meters and electrical equipment containing electrical components must be protected with heavy paper held in place with approved mastic tape to exclude fine dust and particles. Install and maintain sufficient electric heaters in equipment rooms and transformer compartments to keep equipment dry during construction.

3.3 CUTTING AND PATCHING

- A. New Construction:
 - 1. Perform cutting and patching in accordance with Division 01.
 - 2. Provide and set all sleeves, inserts and other items required for the installation of the electrical work, and take responsibility for their final and permanent locations.
 - 3. Confer with, and give the General Construction Trade Contractor, where applicable, complete information as to size of openings in all construction, so that such

openings may be provided as the building progresses. Otherwise, provide openings as required for the electrical work.

4. If openings are omitted or incorrect through failure to follow these instructions the particular Trade Contractor must, at no additional cost to the project, engage the trade which originally installed the work to cut and patch to the satisfaction of the Design Professional.

B. For existing construction:

1. The General Construction Trade Contractor, where applicable, will perform all cutting and patching required for the work of all trades. Otherwise, all Trade Contractor are responsible for their own cutting and patching.

3.4 CONCRETE AND MASONRY

- A. Provide all cast-in-place concrete, pre-cast concrete and masonry work (brick and block) required for completion of the electrical work, including interior and exterior concrete slabs.
- B. Design Professional will review and approve materials used.
- C. Unless shown or specified otherwise, all equipment foundations and housekeeping pads must be six inches (6") minimum height from floor, of sufficient mass, and secured to the floor.
- D. Refer to general construction contract documents for concrete specifications.
- E. Unless noted otherwise, concrete bases must be 4" larger than the largest dimension of the base of the supported equipment in both directions. Use 3000 psi, 28 day compressive strength concrete and reinforcement.

3.5 SUPPORTS

- A. Except where noted otherwise in the specifications and shown on drawings, provide all materials, including, but not limited to, equipment supports, supplies and labor necessary as required to adequately support, brace and strengthen new and/or existing equipment and materials installed under/or affected by the electrical work.
- B. The design, materials, fabrication and erection of structural steel supports must conform to "Specification for Design, Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction, "Code of Standard Practice for Steel Buildings and Bridges". Welding, where required, must conform to "Code of Arc and Gas Welding in Building Construction" of the American Welding Society.

3.6 ESCUTCHEONS

- A. Except as noted otherwise, provide heavy solid pattern, steel, cast iron or malleable iron escutcheons with set screws and prime coat of paint on all conduit exposed to view within

structure where passing through floors, partitions, walls or ceilings. Escutcheons are not required in equipment rooms, boiler rooms or other unfinished areas.

- B. Provide nickel plated cast iron escutcheons where conduits pass through toilet rooms, walls or ceilings.

3.7 MACHINERY GUARDS

- A. Provide OSHA approved expanded sheet steel metal guards over all belt drives, couplings and other moving equipment to protect personnel from injury.
- B. Machinery guards shall comply with OSHA Standards 29 CFR STANDARD NUMBER 1910.212 General Requirements for all Machines; Subpart Number 0; Subtitle - Machinery and Machine Guarding; STANDARD NUMBER 1910.219; Standard Title - Mechanical Power - Transmission Apparatus; Subpart Number 0; Subpart Title - Machinery and Machine Guarding.

3.8 PAINTING AND FINISHING

- A. All painting, generally, will be provided by the General Construction Trade Contractor, where applicable, except where specifically noted otherwise in the Electrical Specifications. Otherwise, all Trade Contractors are responsible for their own painting and finishing.
- B. Equipment and material furnished with factory enamel finish will not be painted unless finish has been damaged, in which case the equipment or material must be refinished by the Trade Contractor who furnished it, to the satisfaction of the Design Professional.

3.9 LUBRICATION

- A. Provide proper and necessary lubrication of any items of operating, rotating or moving equipment which is furnished, installed or which must operate as part of the electrical system.
- B. When an item of operating equipment is furnished and installed by a Trade Contractor, it will be that Trade Contractor's responsibility to accomplish the lubrication.
- C. When an item of operating equipment is furnished by one Trade Contractor and installed by another, it is the responsibility of the Trade Contractor furnishing the equipment to apply the lubricants.
- D. All rotating or moving equipment must be lubricated prior to energizing and operating the equipment. Should the Trade Contractor responsible for the lubrication fail to apply lubricants prior to initial start-up and the equipment is damaged as a result of that Trade Contractor's negligence, that Trade Contractor is required to provide all corrective action necessary including replacement, if required, for the proper operation of equipment.

- E. Lubrication must be accomplished in the manner prescribed or recommended by the manufacturer of the specific item. For motor driven equipment this precaution of lubrication will apply individually to the driver and the driven component.
- F. The lubricants must be of the type, grade, specification and manufacture as prescribed or recommended by the manufacturer of the specific equipment item.
- G. Extend lubrication fittings where required to allow maintenance personnel to lubricate the equipment easily and efficiently.
- H. The Trade Contractor who supplies any item of rotating equipment will have the responsibility of securing written instructions on the lubricating procedure and must furnish not less than one year's supply of all necessary lubricants properly identified so they can be replaced.
- I. Any moving or rotating equipment furnished by the Owner that is to be installed, reused and/or serviced must also be lubricated. Except where noted otherwise in the Contract Documents, the Trade Contractor installing, reusing and/or servicing all such equipment is responsible for the proper lubrication thereof, including obtaining proper lubricating instructions from the various manufacturers involved, furnishing and applying the necessary lubricants and leaving the Owner with a one (1) year supply of lubricant.

3.10 ELECTRICAL TRADE COORDINATION

- A. Equipment by other Trade Contractors shall be furnished with electrical current characteristics as shown on electrical drawings and specifications.
- B. The nameplate voltage of all motors furnished with mechanical equipment must be within the range of the voltage shown for use with the motor as the upper limit, and 5% less than this voltage as the lower limit.
- C. Other Trade Contractors must furnish all motors, motor starters, specialty motor controllers, float and pressure switches, temperature control, other special automatic controls as indicated in the Contract Documents for all equipment furnished and/or installed under their contract except where noted otherwise.
- D. All electrical equipment furnished by other Trade Contractors must be as recommended by the equipment manufacturers, in accordance with the Electrical Specifications for similar items, and of such type as to work properly with automatic temperature control sequences where required.
- E. The Electrical Trade Contractor must provide all push-buttons, safety switches for motors, and wiring from starters to motors and install all starters furnished to him by other Trade Contractors unless otherwise indicated in the Contract Documents.
- F. Where controllers and/or starters are furnished as an integral part of any equipment, the Trade Contractor supplying the equipment must furnish complete wiring between controllers, starters and motors.

- G. The Electrical Trade Contractor must provide disconnect switches for all equipment furnished and/or installed by other Trade Contractors, except where such switches are an integral part of equipment.
- H. Other Trade Contractors must set all motors and furnish, set and pipe as necessary, float switches, temperature control and other special automatic temperature controls.
- I. Other Trade Contractors must provide all power and control wiring required by their respective section of the specification. The Electrical Trade Contractor must provide all other wiring required for the completion of the work of the other Trade Contractors.
- J. Other Trade Contractors must furnish the Electrical Trade Contractor with complete wiring diagrams as required.
- K. Any electrical work performed by the other Trade Contractors must be performed in accordance with the requirements of the ELECTRICAL Section of these specifications.
- L. For additional coordination items, refer to Article 2.2, "Submittals".

3.11 ELECTRICAL MOTORS AND STARTERS

- A. All motors furnished by all Trade Contractors, unless specified to the contrary in Contract Documents, must conform to the following requirements:
 - 1. Characteristics, dimensions, tolerances, temperature rise, insulation, rating, noise, vibration, and all other characteristics in accordance with the latest standards of IEEE or NEMA.
 - 2. Unless required by the driven unit, motors must have normal starting torque, NEMA Design B characteristics. Horsepower rating of motor must be equal to or greater than that required by driven equipment. Current density design of motor rating must be limited so that overload protection provided by standard motor starters will be adequate to prevent damaging overheating during stall, single phasing or slightly prolonged acceleration.
 - 3. Use NEMA Class A or B insulation with motor frames amply sized to provide a 1.15 service factor at an ambient of 40 deg. C maximum. Insulation systems must be designed for an average life of 60,000 hours.
 - 4. All motors must be high efficiency. Meet or exceed requirements in NEMA Standard MG1, Table 12-10.
 - 5. Running power factor must be higher than 0.85 for motors 5 HP to 30 HP and higher than 0.90 for motors 40 HP or larger.
 - 6. Each motor must be mounted on the same bedplate as the equipment driven and be complete with pulleys, slide rails or flexible couplings as required.
 - 7. Each Trade Contractor is responsible in each instance for the proper selection of motors of suitable characteristics with details submitted for approval to the Design Professional prior to installation.
- B. All starters furnished by all Trade Contractors must conform with the following requirements, unless specified to the contrary in the Contract Documents:

1. All starters for 3-phase equipment must be fully enclosed, across-the-line type equipped with solid state overload protection as herein specified for all three phases, low voltage protection, all necessary auxiliary contacts as required and indicating pilot lights. Starters which are controlled automatically must have two-wire control with "ON-OFF-AUTO" switches. Starters which are controlled manually must have 3-wire control with Start-Stop pushbuttons.
 2. All 3-phase starters remotely controlled must have 120 volt coils and control transformers with disconnecting means. Starters for single phase motors shall be manual toggle switches with thermal overload protection and pilot light. Omit pilot light for unit heaters.
 3. General Purpose NEMA-1 enclosure for indoor use under normal atmospheric conditions. Watertight enclosure NEMA-4 or NEMA-5 for outdoor use or where starters are subjected to the splashing or dripping of water. Explosion-proof enclosure NEMA-7, 9 or 12 for dusty or hazardous locations as required by Article 500 of the National Electrical Code.
 4. Individually equip all starters for three phase motors with solid state adjustable overload protection with automatic protection to prevent single phase operation with the following features:
 - a. Three phase, self-powered with current sensing, phase unbalance and phase loss protection, visible trip indication, trip test function, and power "LED."
 - b. Phase loss protection to include automatic restart with a selectable manual switch.
- C. All controllers, starters and other electrical components furnished as an integral part of any apparatus must be furnished complete with integral wiring as required.
- D. Subject to compliance with the requirements, provide products by one of the following:
1. General Electric Co.;
 2. Westinghouse Co.;
 3. Square-D Co.;
 4. Allen-Bradley Co.
 5. Or approved equal in accordance with the project substitution provisions of the contract.
- E. Submittals for motors and starters must be coordinated with Electrical Trade Contractor.

3.12 ELECTRICAL PROVISIONS FOR PACKAGED MECHANICAL EQUIPMENT

- A. Unless otherwise noted in HVAC, Plumbing and Fire Protection Specifications, all packaged equipment furnished by HVAC, Plumbing and Fire Protection Trade Contractors must be complete with the following electrical provisions:
1. General compliance with provisions of the preceding Article, ELECTRICAL MOTORS AND STARTERS.
 2. Starting electrical characteristics of all motors and/or starters must be approved by local utility company and Electrical Engineer.

- B. Approved, factory installed and wired starting, operating and control equipment, terminating in terminal strip for single point power wiring connections by Electrical Trade Contractor must conform with the ELECTRICAL Section of these specifications and must include approved branch fuses for branch power circuits.

3.13 PIPING AND CONDUIT UNDER FLOORS

- A. Wherever piping, conduit or piping enclosures are run under a floor slab on grade, the work is to be installed after the General Construction Trade Contractor, where applicable, has brought the sub-grade to the proper level.
- B. Excavate and backfill as required for the installation of electrical work. The excavation of the sub-grade where required for the installation of the work must be performed, including that for piping, conduit and piping enclosures, by the Electrical Trade Contractor. When the installation is completed and satisfactorily tested, the remaining space shall be filled with crushed stone or other material similar to that to be used by the General Construction Trade Contractor, where applicable, for the sub-base. The backfill must be stabilized by hand or pneumatic tamping as directed by the Design Professional and must be returned to the original sub-grade level.
- C. No piping, conduit or piping enclosures is to be installed in the stone sub-base which is part of the General Construction Trade Contractor's work, where applicable, unless specific permission is granted by the Design Professional.
- D. Where piping is noted to be installed in enclosures, such as split terra cotta pipe, necessary protection of the insulation, arrangement and installation will be as hereinafter described in the detailed technical specifications.
- E. Where required by drawing notes, specifications, or applicable electrical codes, conduits installed under floors must be encased in concrete, conforming to the general construction contract documents specifications.

3.14 EQUIPMENT IDENTIFICATION

- A. Manufacturer: Subject to compliance with the requirements, provide products by one of the following:
 - 1. Seton Nameplate Corporation;
 - 2. Marking Services, Inc.;
 - 3. Brady Worldwide.
 - 4. Or approved equal in accordance with the project substitution provisions of the contract.
- B. Identify all equipment as to nature, service and purpose by means of permanently attached plastic nameplates having ½" high letters, dull black outside and white core. Nameplates of approved size, beveled edges and engraved through black to white core. Nameplates shall indicate equipment identification names and numbers as approved by the Owner.

3.15 ABANDONMENT, REMOVAL AND RELOCATION

- A. Perform all abandonment, removal and relocation work required for completion of electrical systems.
- B. Removals shown on drawings are a general indication only, and may not necessarily indicate the full extent of removals which may be required to complete this work.
- C. Where existing partitions, walls, ceilings and floors are to be removed, all piping, conduits, materials and equipment attached or fastened thereto or within, as applicable, must be carefully removed.
- D. Where work under this contract interferes with the existing construction, ductwork, piping, conduit or equipment, remove all such materials and route new work to clear the obstruction. Provide additional piping, conduits, and material of the same design and quality if the piping and/or conduit is to be continued in use.
- E. Disconnect and remove all accessible piping, conduit, ductwork, materials, fixtures and equipment not required in the new systems. Plug all outlets at the main or riser connection.
- F. Removed materials not desired by the Owner and not to be reset and not specified nor indicated to be reused, become the property of the Electrical Trade Contractor and must be promptly removed from site.
- G. All demolition work is subject to the direction and approval of the Design Professional and must be performed in such manner as not to interfere with the normal operation of the building.
- H. Relocate existing utilities and/or equipment that must remain to maintain operation of building or parts of building outside the work area.
- I. Equipment Pad Removal:
 - 1. Remove all concrete pads and equipment support structure material related to the Electrical Trade, not indicated or specified for reuse. Remove concrete pads to one (1) inch below adjacent concrete floor surface. Exterior slabs shall be broken and removed as waste materials.
 - 2. Cut-off reinforcement and anchor bolts at or below level of pad removal.
 - a. Resurface area level with adjacent concrete floor surface using a heavy duty aggregate concrete topping consisting of Portland cement Type I or Type III conforming to ASTM C150 with aggregate graded by weight to pass sieves as follows:

Fine (Thin Coat)		or	Course (Heavy Coat)	
3/8"	100%		1/2"	100%
No. 4	95-100%		3/8"	30-50%
No. 8	65-80%		No. 4	0-15%
No. 16	45-65%		No. 8	0-5%

No. 30 25-45%

No. 100 0-5%

- b. Topping mix must contain a high range water reducing admixture (super plasticizer) ASTM C494, Type F or Type G.
- c. Coat surface with epoxy bonding agent prior to application of concrete topping.
- d. Produce a heavy duty concrete topping with the following characteristics:

Compressive Strength 5000 psi at 28 days

Slump 8" maximum

Water to Cement Ratio 0.44.

3.16 SMOKE AND FIRESTOPPING (METHODS)

- A. Installation of materials must be performed by applicator/installers qualified, trained and approved by the manufacturer of the materials, and be installed in accordance with ASTM E 814.
- B. Install smoke and firestopping at locations required, shown, or specified in accordance with applicable codes, manufacturer's written instructions, and test report, applying to the specific trade equipment as applicable. Cutting and patching of construction and providing sleeves, where required, is shown on drawings or specified in other sections.
 - 1. Filling of Voids: Smoke and firestopping materials must completely fill void spaces regardless of geometric configuration, subject to tolerances established by the manufacturer. Smoke and firestopping for filling voids in floors in which the smallest dimension of the void is 4 in. or more must support the same load as the floor is designed to support or must be protected by a permanent barrier to prevent loading or traffic in the smoke or firestopped areas.
 - 2. Electrical Cables or Conduits: Smoke and firestopping at penetrations of electrical cables or conduits must comply with the requirements of NFPA No. 70.
 - 3. Where smoke and firestopping of penetrations in floors, walls and partitions that will be exposed in completed construction, provide protection as necessary to prevent damage to adjacent surfaces and finishes, and provide escutcheons or other trim.
 - 4. Schedule the installation and required inspection of smoke and firestops for penetrations that will be concealed in completed construction prior to erection of floors, walls, and partitions that would permanently conceal the penetrations.
- C. All areas of smoke and firestopping installation must be accessible until inspection by the applicable code authorities.

3.17 CONCRETE PATCHING (PROCEDURE)

- A. Remove any loose debris, chipped or cracked portions of concrete, and any grease, oil, dirt or other coating materials from the concrete to be patched.
- B. Apply epoxy bonding adhesive to the clean dry surface with a brush or roller to briefly flood the surface allowing good penetration, if completely absorbed, apply additional material.

- C. Subject to compliance with the requirements, provide products by one of the following:
 - 1. Edison Coatings Inc. Flexi-Bond 540;
 - 2. Sika Corp.;
 - 3. Euclid Chemical Co.
 - 4. Or approved equal in accordance with the project substitution provisions of the contract.
- D. Apply new cementitious mortar patch to surface immediately after applying bonding adhesive, bonding agent should be wet while applying concrete patch. Mortar patch equal to Moxie International 2000 Super Patch. Refer to Division 03 of these specifications.
- E. Work patch into any cracks or crevices with a brush, then apply remainder of patch and trowel until level and smooth.
- F. Do not apply patch below 45 deg. F.

3.18 TEMPORARY PARTITIONS

- A. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas. Refer to the general construction contract documents of these specifications.

3.19 INITIAL APPLICATION FOR PAYMENT

- A. Provide the following prior to submitting the initial application for payment:
 - 1. Copy of the Electrical Trade Contractor's and Sub-Contractors' licenses for the state in which the work is being performed.
 - 2. Resumes for the designated Project Manager and Project Foreman.
 - 3. List of independent agencies who will be engaged by the Electrical Trade Contractor to perform tests, provide certifications, conduct inspections, etc. as required by Contract Documents.
- B. The initial application for payment will not be processed until the items above are submitted.

3.20 FINAL APPLICATION FOR PAYMENT

- A. Provide the following prior to submitting the final application for payment:
 - 1. Refer to general construction contract documents of these specifications.
 - 2. Equipment Start-Up Reports for each piece of electrical equipment.
 - 3. Electrical Inspection Agency's written report.
 - 4. Operating and Maintenance Manuals and Data.
 - 5. Electrical systems and equipment warranties.
 - 6. Electrical System Commissioning Report.

7. Electrical Trade Contractor's Punch List of incomplete work items with reason why each work item is not complete and anticipated schedule for completion. Submit at least one week prior to Engineer's final Construction Observation Report site visit.
 8. Electrical Trade Contractor's notarized certification letter.
 9. As-built drawings as described in Part 1 of this specification section.
- B. Final payment is contingent upon completion of all items listed above.

3.21 ADDITIONAL ELECTRICAL TRADE CONTRACTOR PAID FEES AND EXPENSES

- A. As a material part of the Electrical Trade Contractor's Agreement to complete the work of this Contract, the Electrical Trade Contractor agrees to reimburse Gillan & Hartmann, Inc. ("Design Professional") for the below listed extra engineering work under the following conditions:
1. Design Professional's hourly billing rate shall be \$150.00 per hour for all related office hours, travel time and as applicable, on-site time;
 2. Electrical Trade Contractor's request(s) for substitution;
 - a. When such requests for substitution are not the result of a bonafide delivery problem or design related problem, and;
 - b. When such requests do not address items of equipment for which the specifications list the basis of design with at least one comparable product, and;
 - c. The Electrical Trade Contractor's request(s) for substitution must be submitted in writing, and;
 - d. The Electrical Trade Contractor agrees to compensate the Design Professional \$1,500.00 (per diem) for the review of each proposed substitution;
 - e. The Electrical Trade Contractor shall render written acceptance of the Design Professional's extra charges, and;
 - f. Any balance not paid will be deducted from contractors final payment.
 3. Extra Design Professional work created by the Electrical Trade Contractor's multiple submissions of a single material or piece of equipment;
 - a. The Design Professional's basic services include two reviews for each piece of equipment or material submittal. The Design Professional's first review takes place at the initial Electrical Trade Contractor's submission of that submittal. The Design Professional's second review takes place when the Design Professional requires a resubmission of that submittal.
 - b. If the Design Professional's third review of a particular submittal is required for reasons due to the Electrical Trade Contractor, the Trade Contractor agrees to compensate the Design Professional \$1,500.00 for each submittal review.
 - c. Any unpaid balance due will be deducted from the Trade Contractors final payment.
 4. Extra work created by the Electrical Trade Contractor resolution of substantial completion and final completion construction observation reports and project closeout documentation:

- a. The Design Professional's basic services rendered to the Owner include periodic visits to the site and providing written list of items (Construction Observation Report) requiring the Electrical Trade Contractor's attention, reporting and resolution;
- b. The Electrical Trade Contractor shall provide written feedback and prompt resolution of Construction Observation Items including a written schedule for the Electrical Trade Contractor's completion of these Items followed by a written confirmation of closure;
- c. The contract documents specify the Electrical Trade Contractor's requirements including written notification of substantial completion, including contractor's prepared punch list of items to be completed;
- d. The Design Professional services include: the preparation of one (1) substantial completion/final completion observation report; and one (1) review of the Electrical Trade Contractor's resolution of the substantial completion/final completion observation report.
- e. The Electrical Trade Contractor agrees to compensate the Design Professional \$1,500.00 (per diem) for the preparation of additional substantial completion/final completion reports as required to achieve final completion.
- f. Any unpaid balance will be deducted from the contractor's final payment.

3.22 FORMS

Date: 5/25/2016

GILLAN HARTMANN, INC. REQUEST FOR PROFESSIONAL'S REVIEW/COMMENT
 140 Whitaker Avenue, Mont Clare, PA 19453 PROPOSED MANUFACTURERS SUB-CONTRACTORS LIST

Project No.: _____
 Contract No.: _____
 Project Title: _____
 Location: _____
 Contractor's Authorized Staff Signature: _____
 Print Name: _____

1.) LIST OF ABBREVIATORS (ABB): **MFR:** MANUFACTURER **SUB:** SUBCONTRACTOR **SUBST:** SUBSTITUTION
TEST: TESTING AGENCY **WELDER:** WELDER **CERT:** CERTIFICATION
FAB: FABRICATOR **SUP:** SUPPLIER

2.) SIGNIFY BY **X**, IF PRODUCT IS BASIS OF DESIGN, AS DEFINED IN THE CONTRACT DOCUMENTS;
 3.) SIGNIFY BY **X**, IF PRODUCT A LISTED MANUFACTURER (VARIATION), AS DEFINED IN THE CONTRACT DOCUMENTS; LIST MANUFACTURER
 4.) SIGNIFY BY **X**, IF PRODUCT IS A COMPARABLE PRODUCT; I.E. NOT LISTED IN THE CONTRACT DOCUMENTS (SUBSTITUTION), AS DEFINED IN THE CONTRACT DOCUMENTS; CERTIFICATION OF COMPARABLE PRODUCT FROM MANUFACTURER MUST BE ATTACHED. INCLUDE ASSOCIATED DOCUMENTATION REQUIRED BY THE CONTRACT DOCUMENTS.
 5.) SIGNIFY BY **Y** OR **N**, IF PROPOSED SUBCONTRACTOR IS AN INDEPENDENT AGENT WITH NO CONFLICT OF INTEREST WITH CONTRACTOR.

CONTRACTOR NAME AND ADDRESS:

Material or Work; Indicate associated Specifications Section (Page/Para.	ABB (1)	Basis of Design (2)	Listed Manufacturer/ Variation (3)	Comparable Product/ Substitution (4)	Name & Address	Relation to Contractor Y or N (5)	ADDITIONAL SUBMITTAL INFORMATION REQUESTED BY PROFESSIONAL, BASED ON INITIAL SUBMISSIONS										
							Submit (6)	FOR PROF. USE ONLY	Sample	Step Data	Cert	Subst. Info	None Requested	Proceed Submittal	REJ		
EXAMPLE: Hydraulic Piping - Section 1510.2.2	SUP	X			XYZ FIRM, 1234 MAIN ST SMALL TOWN, US XXXXX	N		X									

REVIEWED:

SIGNATURE OF PROFESSIONAL

PROJECT NAME: Gillan Hartmann, Inc. JOB NO.: DATE: 5/25/2016
 ELECTRICAL SHOP DRAWING LOG

ITEM NO.	PROPOSED DATE OF	ACTUAL DATE OF SUBMITTAL	MFR. OR CONTRACTOR	DESCRIPTION	DESIGN PROFESSIONAL'S ACTION	DATE RETURNED	RE-SUBMIT	Checked by
E-01								
E-02								
E-03								
E-04								
E-05								
E-06								
E-07								
E-08								
E-09								
E-10								
E-11								
E-12								
E-13								
E-14								
E-15								
E-16								
E-17								
E-18								
E-19								

Contractor's Submittal Description: _____, Project _____
(Fill In) (Fill In)

ELECTRICAL CONTRACTOR'S TRANSMITTAL COVER SHEET

TO: GILLAN & HARTMANN, INC.
CONSULTING ENGINEERS
P.O. BOX 345
VALLEY FORGE, PENNSYLVANIA 19481

Date of Transmittal: _____	By Contractor: _____ Contractor's Authorized Staff Signature: _____ Print Name: _____ Project: _____
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By executing this Transmittal Cover, the Contractor agrees and accepts that:

- Submittals without the HVAC/Plumbing/Fire Protection and Electrical Contractor's signed stamp of approval will not be reviewed. Initialed approval stamps are not acceptable. All resulting resubmittals will be provided at the Contractor's expense.
- The Engineer's recommendation of acceptance ("Furnish as Submitted", "Furnish as Noted Below", etc.) of the equipment proposed by the Contractor is conditional upon the Contractor fulfilling all obligations of the Contract Documents. By furnishing the proposed equipment, the Contractor acknowledges compliance with all of the following:
 - The Contractor has completed field layout and planning of proposed equipment and has coordinated all other related shop drawings, related trades involved in Project Construction, and all space requirements.
 - The Contractor has examined all shop drawings prior to submission. The Contractor forwards all shop drawings with a signed approved stamp, signifying the following:
 - 1) All field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data have been verified.
 - 2) The Architect/Engineer has been notified of all site conditions which affect the work, and which require design resolution beyond resolution by Trade contractors' Field Decisions;
 - 3) All items herein are approved by the Contractor, and have been coordinated and checked with other applicable submittals, and contract requirements;
 - 4) Submission is clearly marked to indicate which manufacturer's options are provided and which are not provided with the proposed equipment.
 - Any and all exceptions requested by the HVAC/Plumbing/Fire Protection and Electrical Contractors have been included in written form. All exceptions, deletions, and additions that vary from the Contract Documents have been specifically annotated and initialed. Failing to provide the initialed annotations for all deletions and additions, the Contractor accepts the condition that the Contract Documents will govern, and will be used to resolve disputes.
 - All Engineer's notes regarding this submission must be incorporated into the Project.
 - The Engineer's review is limited to comparison of the technical performance of the Contractor's proposed equipment to the specified technical performance.
 - Equipment submittal is either the Basis-of-Design, or a comparable product to the Basis-of-Design.
 - A Comparable Product must meet or exceed all the salient characteristics and standards necessary including, but not limited to: material of manufacture; independent testing agency certifications; quality; function; design; and performance required to meet the Owner's needs and meet the objectives of the Professional's Project Design.
 - Extension of Contract Time and/or claim for delay are not acceptable as created by the Trade Contractor's failure to provide submittals on a timely basis to permit the processing work of the Professional, including multiple resubmittals, and/or failure to provide submittals that are comparable to the Basis of Design Product. Refer to EQUIPMENT VARIATIONS AND SUBSTITUTIONS article in the General Requirements Section of the Specifications.

G&H Project No: _____

G&H Shop Drawing Review No: _____ E-_____

Contractor's Submittal Description: _____, Project _____
(Fill In) (Fill In)

**HVAC AND ELECTRICAL TRADES'
COORDINATION OF HVAC EQUIPMENT
ELECTRICAL REQUIREMENTS
TRANSMITTAL COVER SHEET**

TO: GILLAN & HARTMANN, INC.
CONSULTING ENGINEERS
P.O. BOX 345
VALLEY FORGE, PENNSYLVANIA 19481

By HVAC Trade Rep: _____
Contractor's Authorized Staff Signature: _____
Print Name: _____
Date of Transmittal: _____

By Electrical Trade Rep: _____
Contractor's Authorized Staff Signature: _____
Print Name: _____
Date of Transmittal: _____

By executing this Transmittal Cover, the Contractor agrees and accepts that:

1. Submittals without the HVAC and Electrical Trades' signed stamp of approval will not be reviewed. Initialed approval stamps are not acceptable. All resulting resubmittals will be provided at the Contractor's expense.
2. The HVAC Trade Representative has submitted the attached HVAC Equipment Submittal to the Electrical Trade Representative for examination, review, and coordination of the attached HVAC Equipment Electrical Requirements. The equipment proposed by the Contractor is conditional upon the Contractor fulfilling all obligations of the Contract Documents. By furnishing the proposed equipment, the Contractor acknowledges compliance with all of the following:
 - A. The Contractor has completed field layout and planning of proposed equipment and has coordinated all other related submittals, related Trades involved in Project Construction, and all space requirements.
 - B. The HVAC and Electrical Trades have examined all submittals prior to submission. The HVAC and Electrical Trades forwards all submittals with a signed transmittal stamp, signifying the following:
 - 1) All field measurements, field construction criteria, electrical power requirements and similar data have been verified;
 - 2) The Architect/Engineer has been notified of all site conditions which affect the work, and which require design resolution beyond resolution by Trade contractors' Field Decisions;
 - 3) All items herein are approved by the Contractor, and have been coordinated and checked with other applicable submittals, and contract requirements;
 - 4) Submission is clearly marked to indicate which manufacturer's options are provided and which are not provided with the proposed equipment.
 - C. Any and all exceptions requested by the HVAC and Electrical Trades have been included in written form. All exceptions, deletions, and additions that vary from the Contract Documents have been specifically annotated and initialed. Failing to provide the initialed annotations for all deletions and additions, the Contractor accepts the condition that the Contract Documents will govern, and will be used to resolve disputes.

G&H Project No: _____

G&H Shop Drawing Review No: _____

Contractor's Submittal Description: _____, Project _____
(Fill In) (Fill In)

**PLUMBING AND ELECTRICAL TRADES'
COORDINATION OF PLUMBING EQUIPMENT
ELECTRICAL REQUIREMENTS
TRANSMITTAL COVER SHEET**

TO: GILLAN & HARTMANN, INC.
CONSULTING ENGINEERS
P.O. BOX 345
VALLEY FORGE, PENNSYLVANIA 19481

By Plumbing Trade Rep: _____ Contractor's Authorized Staff Signature: _____ Print Name: _____ Date of Transmittal: _____	By Electrical Trade Rep: _____ Contractor's Authorized Staff Signature: _____ Print Name: _____ Date of Transmittal: _____
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By executing this Transmittal Cover, the Contractor agrees and accepts that:

1. Submittals without the Plumbing and Electrical Trades' signed stamp of approval will not be reviewed. Initialed approval stamps are not acceptable. All resulting resubmittals will be provided at the Contractor's expense.
2. The Plumbing Trade Representative has submitted the attached Plumbing Equipment Submittal to the Electrical Trade Representative for examination, review, and coordination of the attached Plumbing Equipment Electrical Requirements. The equipment proposed by the Contractor is conditional upon the Contractor fulfilling all obligations of the Contract Documents. By furnishing the proposed equipment, the Contractor acknowledges compliance with all of the following:
 - A. The Contractor has completed field layout and planning of proposed equipment and has coordinated all other related submittals, related Trades involved in Project Construction, and all space requirements.
 - B. The Plumbing and Electrical Trades have examined all submittals prior to submission. The Plumbing and Electrical Trades forwards all submittals with a signed transmittal stamp, signifying the following:
 - 1) All field measurements, field construction criteria, electrical power requirements and similar data have been verified;
 - 2) The Architect/Engineer has been notified of all site conditions which affect the work, and which require design resolution beyond resolution by Trade contractors' Field Decisions;
 - 3) All items herein are approved by the Contractor, and have been coordinated and checked with other applicable submittals, and contract requirements;
 - 4) Submission is clearly marked to indicate which manufacturer's options are provided and which are not provided with the proposed equipment.
 - C. Any and all exceptions requested by the Plumbing and Electrical Trades have been included in written form. All exceptions, deletions, and additions that vary from the Contract Documents have been specifically annotated and initialed. Failing to provide the initialed annotations for all deletions and additions, the Contractor accepts the condition that the Contract Documents will govern, and will be used to resolve disputes.

G&H Project No: _____

G&H Shop Drawing Review No: _____

END OF SECTION 260010

SECTION 260050 - BASIC ELECTRICAL 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Supporting devices for electrical components.
 - 2. Electrical identification.
 - 3. Electrical demolition.
 - 4. Cutting and patching for electrical construction.
 - 5. Touchup painting.

1.3 SUBMITTALS

- A. Product Data: For electricity-metering equipment.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

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. Comply with NFPA 70.

1.5 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
 - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
 - 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.
- G. Electrical devices and boxes are indicated on Drawings in approximate locations unless dimensioned. Adjust box or device location up to 10 feet, if required to accommodate intended purpose or owner request, with no additional cost to contract.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.
 - 1. Channel Thickness: Selected to suit structural loading.
 - 2. Fittings and Accessories: Products of the same manufacturer as channel supports.
- D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, and wall brackets.
- E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

- G. Expansion Anchors: Carbon-steel wedge or sleeve type.
- H. Toggle Bolts: All-steel springhead type.
- I. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 ELECTRICAL IDENTIFICATION

- A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B. Raceway and Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.
 - 1. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is over laminated with a clear, weather- and chemical-resistant coating.
 - 2. Color: Black letters on orange background.
 - 3. Legend: Indicates voltage.
- C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick (25 mm wide by 0.08 mm thick).
- D. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
 - 1. Not less than 6 inches wide by 4 mils thick (150 mm wide by 0.102 mm thick).
 - 2. Compounded for permanent direct-burial service.
 - 3. Embedded continuous metallic strip or core.
 - 4. Printed legend that indicates type of underground line.
- E. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- F. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- G. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch (1.6-mm) minimum thickness for signs up to 20 sq. in. (129 sq. cm) and 1/8-inch (3.2-mm) minimum thickness for larger sizes. Engraved legend in black letters on white background.
- H. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.
- I. Exterior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm), galvanized-steel backing, with colors, legend, and size appropriate to the application. 1/4-inch (6-mm) grommets in corners for mounting.
- J. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.3 TOUCHUP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.3 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.
- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical conductor supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.
- K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
 - 1. Wood: Fasten with wood screws or screw-type nails.
 - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 - 3. New Concrete: Concrete inserts with machine screws and bolts.
 - 4. Existing Concrete: Expansion bolts.
 - 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
 - 6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.
 - 7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
 - 8. Light Steel: Sheet-metal screws.

9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Identify raceways and cables with color banding as follows:
 1. Bands: Pre-tensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches (51 mm) wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
 2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (8-m) maximum intervals in congested areas.
 3. Apply the following colors to the systems listed below:
 - a. Fire Alarm System: Red.
 - b. Fire-Suppression Supervisory and Control System: Red and yellow.
 - c. Combined Fire Alarm and Security System: Red and blue.
 - d. Security System: Blue and yellow.
 - e. Mechanical and Electrical Supervisory System: Green and blue.
 - f. Telecommunication System: Green and yellow.
- E. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- F. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.
- G. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
 1. Phase A: Black.
 2. Phase B: Red.
 3. Phase C: Blue.
 4. Neutral: White.
 5. Ground: Green.

- H. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- I. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.
- J. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high lettering on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:
 - 1. Panelboards, electrical cabinets, and enclosures.
 - 2. Access doors and panels for concealed electrical items.
 - 3. Electrical switchboards.
 - 4. Disconnect switches.
 - 5. Enclosed circuit breakers.
 - 6. Motor starters.
 - 7. Push-button stations
 - 8. Contactors.
 - 9. Control devices.
 - 10. Transformers...

3.5 FIRESTOPPING

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Firestopping."

3.6 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
- C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- D. Remove demolished material from Project site.

- E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.7 CUTTING AND PATCHING AND PAINTING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.8 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 - 1. Raceways.
 - 2. Building wire and connectors.
 - 3. Supporting devices for electrical components.
 - 4. Electrical identification.
 - 5. Electricity-metering components.
 - 6. Concrete bases.
 - 7. Electrical demolition.
 - 8. Cutting and patching for electrical construction.
 - 9. Touchup painting.

3.9 REFINISHING AND TOUCHUP PAINT

- A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 09 Section "Painting."
 - 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 - 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 - 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.10 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 260050

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Copper building wire rated 600 V or less.
 - 2. Metal-clad cable, Type MC, rated 600 V or less.
 - 3. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

- A. VFC: Variable-frequency controller.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: Indicate type, use, location, and termination locations.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- D. Conductor Insulation:
 - 1. Type NM: Comply with UL 83 and UL 719.
 - 2. Type THHN and Type THWN-2: Comply with UL 83.
 - 3. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
 - 4. Type XHHW-2: Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- B. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. Comply with UL 1569.
 - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- D. Ground Conductor: Insulated.
- E. Conductor Insulation:
 - 1. Type TFN/THHN/THWN-2: Comply with UL 83.
 - 2. Type XHHW-2: Comply with UL 44.
- F. Armor: Steel.

- G. Jacket: PVC applied over armor.

2.3 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
 - 1. Material: Copper.
 - 2. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- B. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Branch Circuits: Type THHN/THWN-2, single conductors in raceway.
- B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway; MC, 3 conductor cable with 90 degree-C insulation where allowed by local and national codes.
- C. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- D. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- E. Class 1 Control Circuits: Type THHN-THWN conductors in raceway.
- F. Class 2 Remote control, Signaling, and Power Limited Wiring: In concealed spaces provide Plenum Rated Wiring bundled and supported using J-Hooks. In exposed locations, provide wire or cable in raceway.
- G. Use conductor not smaller than #12 for power circuits.
- H. Use conductor not smaller than #14 for control circuits.

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 "Raceways and Boxes" 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 "Basic Electrical Materials and Methods."

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.
- 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 specification "Basic Electrical Materials and Methods."
- 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 "Basic Electrical Materials and Methods."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Testing: Provide the following tests:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency and testing agency's field supervisor.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in "Operation and Maintenance Data," include the following:
 - a. Instructions for periodic testing and inspection of grounding features at test wells, and ground rings based on NFPA 70B.
 - 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - 2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

- A. Insulated Conductors: Tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.3 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches below grade.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Metallic Fences: Comply with requirements of IEEE C2.
 - 1. Grounding Conductor: Bare, tinned copper, not less than No. 8 AWG.
 - 2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
 - 3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. Use exothermic welds for all below-grade connections.
 - 3. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Test Wells: Ground rod driven through drilled hole in bottom of handhole.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
- G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

- H. Exterior Equipment Ground Ring shown on the drawings: Install a grounding conductor, electrically connected to each piece of equipment and to the ground rods extending around the perimeter of the equipment.
 - 1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps.
 - 2. Bury ground ring not less than 24 inches below finished grade.
- I. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than shown on the single line diagram.
 - 1. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
- J. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections with the assistance of a factory-authorized service representative.
- D. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at

ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

- a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each test well, ground rod and 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.
- E. Grounding system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
- H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal conduits and fittings.
 - 2. Nonmetallic conduits and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Surface raceways.
 - 5. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.
- B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension systems with other construction that penetrates ceilings or is supported by them, including but not limited to lighting fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
- B. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.
- C. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. GRC: Comply with ANSI C80.1 and UL 6.
3. IMC: Comply with ANSI C80.6 and UL 1242.
4. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - a. Comply with NEMA RN 1.
 - b. Coating Thickness: 0.040 inch, minimum.
5. EMT: Comply with ANSI C80.3 and UL 797.
6. FMC: Comply with UL 1; zinc-coated steel.
7. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings:

1. Comply with NEMA FB 1 and UL 514B.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
5. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: compression.
6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

- #### **C. Joint Compound for IMC or GRC, Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.**

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

1. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
3. LFNC: Comply with UL 1660.

B. Nonmetallic Fittings:

1. Fittings, General: Listed and labeled for type of conduit, location, and use.
2. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
 - a. Fittings for LFNC: Comply with UL 514B.
3. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Wireway Covers: Hinged type unless otherwise indicated.
- D. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.
- C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, Type FD, with gasketed cover.
- D. Metal Floor Boxes:
 - 1. Material: Cast metal for applications at grade level or sheet metal above grade.
 - 2. Shape: Rectangular.
 - 3. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- I. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- J. Cabinets:
 - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit Below Roof: IMC.

2. Rooftop: IMC with screw couplings and expansion joints as required.
3. Concealed Conduit, Aboveground: GRC or IMC.
4. Underground Conduit: RNC, Type EPC-40-PVC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed and Subject to Severe Physical Damage: GRC or IMC. Raceway locations include the following:
 - a. Loading areas.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: GRC or IMC.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel or cast-metal fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Specification Section 260050 "Basic Electrical Materials and Methods."
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above floor.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- K. 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.
- L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings 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.
- M. Flexible Conduit Connections: Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations.
- N. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in applicable Division 07 Sections.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve minimum Metal Thickness:
 - 1. For sleeve cross-section rectangle perimeter less than 50-inches and no side greater than 16-inches, thickness shall be 0.052 inch.
 - 2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than. 16-inches, thickness shall be 0.138 inch.
- E. 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.
- F. Cut sleeves to length for mounting flush with both surfaces of walls.
- G. Extend sleeves installed in floors 2-inches above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed or unless seismic criteria require different clearance.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to applicable Division 07 Sections for materials and installation.
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with applicable Division 07 Sections.
- L. Roof-Penetrations Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.
- M. Aboveground, Exterior-Wall 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.
- N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.5 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in applicable Division 07 Sections.

3.6 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260923 - DIGITAL PROGRAMMED LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section includes requirements for a complete and fully functional Digital Programmed Lighting Control system in each of the rooms shown on the drawings using the components included on the drawing E001 Symbol Legend using the Wattstopper Legrand part numbers listed as the Basis of Design.
- C. The final design of the automatic lighting control systems in each room shall provide the number of components to comply with the "Automatic Lighting Control General Notes" listed on drawing E001 and the code requirements of ANSI/ASHRAE/IES Standard 90.1-2019 Section 9 Lighting and Section 8 Power. Provide all required additional components, parts, accessories, power supplies, and wiring as required to utilize these components for a complete digital automatic lighting control system in each room that these components are shown on the drawings. The quantity of devices shown on the drawing is diagrammatic and not indicative of the actual quantity of devices and wiring required by the manufacturer's final design for these systems.
- D. Provide all required computer software, software licenses, and computer cable/adapter equipment required to program the lighting control equipment located in each room. Install the control software on a computer furnished by the Owner and provide all required control devices and software required to connect the computer to the lighting control equipment and provide the software and control training described in this specification.
- E. See drawing E001 "Automatic Lighting Control General Notes" and drawing E701 details 1/E701, 2/E701, and 3/E701 for the lighting and receptacle control applications and sequence of operation requirements.

1.2 DEFINITIONS

- A. Zone: Defines areas subject to primary or secondary daylight harvesting.
- B. Channel: Defines areas independently controlled in the same room.

1.3 SUMMARY

- A. Provide time-based, occupancy sensor-based, and manually switched on/off and manual dimming lighting control according to the Sequence of Operations listed in the drawing E001 Automatic Lighting Control General Notes.

- B. The Contractor shall obtain the services of a factory authorized representative to conduct a post installation test of each of the lighting control devices provided as a part of this project (analog and digital lighting control devices) as a part of this project. After testing is complete and it has been confirmed that the devices fulfill the requirements listed in the General Section of this specification, the Contractor shall provide a written report to the Architect and Engineer confirming the results of the tests with a written description of any necessary corrective actions.

1.4 SUBMITTALS

- A. Provide Product Datasheets for each of the programmed light control devices that includes general device descriptions, dimensions, electrical specifications, wiring details, and nomenclature.
- B. Provide Riser Diagrams for each of the rooms (Typical drawings are acceptable for classrooms and offices) illustrating how the lighting control system components in each room are wired. The diagrams shall include 120V or 277V (as applicable) power wiring, dimming control wiring, and the low voltage control wiring. The diagrams shall also include the sequence of operation to confirm that the devices will provide the sequence of operations listed in the drawing E001 Automatic Lighting Control General Notes.
- C. Provide a detailed narrative description of the controls systems operation for each room type (with or without daylight harvesting, with one or more channels, with occupancy sensors or vacancy sensors, etc.)
- D. Provide a written schedule with proposed dates for the pre-construction conference.
- E. Hardware and software Operation Manuals.

1.5 PROJECT CLOSEOUT DOCUMENTATION

- A. Provide a hardcopy factory published manual that includes:
 - 1. Warranty.
 - 2. Technical Support Contact.
 - 3. Provide copies of device cut sheets, riser diagrams, and floorplans that were submitted as shop drawings.
 - 4. Provide hardware and software Operation Manuals.
 - 5. Additional electronic copy of the product cut sheets and operations manual on a computer zip drive.

1.6 QUALITY ASSURANCE

- A. In high humidity or cold environments, the sensors shall be coated and rated for condensing humidity and -40 deg F operation.
- B. All applicable products must be UL/CUL listed or listed by other acceptable national testing organization.

1.7 PROJECT CONDITIONS

- A. Only install equipment after the following site conditions are maintained:
 - 1. Ambient Temperature 14 to 105 deg F.
 - 2. Relative Humidity less than 90% non-condensing.
- B. Standard electrical enclosures are permanently installed.
- C. Equipment is protected from dust, debris, and moisture.

1.8 WARRANTY

- A. Five (5) year 100% parts replacement.

1.9 MAINTENANCE AND SUSTAINABILITY

- A. Provide new parts, software, upgrades, and/or replacements available for a minimum of 5 years available to the end user.
- B. Provide free telephone technical support.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of design: Wattstopper products.
- B. Acceptable alternate Manufacturers who meet specification requirements.
 - 1. Leviton.
 - 2. Aquity.
 - 3. Or equal as approved by the Professional.

2.2 INDIVIDUAL DEVICE SPECIFICATIONS

- A. Zone Controllers: Wattstopper LMZC-301 Series or equal.
- B. Room Controllers: Wattstopper LMRC-210 (0-10 volt dimming) Series or equal.
- C. Split Receptacle Plug Load Controllers: Wattstopper LMPL-101 Series or equal.
- D. Dual Technology Occupancy Sensors (Used in Offices and Classrooms) : Wattstopper LMDC-100 Series or equal.
- E. Corridor Occupancy Sensors: Wattstopper LMDC-100 Series with a minimum coverage of 100' X 100' with a minimum coverage of 90 linear feet in two directions.

- F. Vacancy Sensors: Wattstopper LMDC-100 Series programmed to provide vacancy sensor input to the required Room Controller.
- G. Dimming Wall Switches: LMDM-101 Series or equal.
- H. Non-Dimming Manual On/Off Switches to work with the dimming Wall Switches in a three-way application: Wattstopper switch compatible with the LMDM-101 Series.
- I. Corridor Keyed Manual On Switch (As required by the Code). Provide Wattstopper switch compatible with the LMDM-101 Series that satisfies the code requirement for a local manual switch.
- J. Emergency Lighting Control Unit: Wattstopper ELCU-200 Series of equal.

2.3 STARTUP AND SUPPORT FEATURES

- A. To facilitate start-up, all devices daisy-chained together by control/communication cable shall automatically be grouped together into a functional lighting control zone.
- B. All lighting control zones shall be able to function according to default settings once adequate power is applied and before any system software is installed.
- C. Once Software is installed, system shall be able to auto-discover all system devices without requiring any commissioning.
- D. All devices within the network shall be able to have their firmware upgraded remotely and without being physically uninstalled for purposes of upgrading functionality at a later date.
- E. All sensor devices shall have the ability to detect improper communication wiring and blink a signal LED in a specific cadence as to alert installation/startup personnel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

- A. Comply with NECA 1.

- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3 WIRING INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Comply with Section 16120.
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and non-power limited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 16010.
 - 1. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. In addition to the requirements listed in Part 1.3 of this specification, perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Lighting control devices will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 - 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
 - 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train the Owner's maintenance personnel (provide a minimum of three hours of training time to demonstrate the programming software provided as a part of this project) to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Straight-blade convenience, hospital-grade, and tamper-resistant receptacles.
 - 2. GFCI receptacles.
 - 3. Toggle switches.
 - 4. Wall plates.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.
- D. Devices for Owner-Furnished Equipment:
 - 1. Receptacles: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.
- E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

- A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498.
- B. Tamper-Resistant Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

2.3 GFCI RECEPTACLES

- A. General Description:
 - 1. 125 V, 20 A, straight blade, feed-through type. Tamper Resistant.
 - 2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
 - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

2.4 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:

- C. Key-Operated Switches: 120/277 V, 20 A.
 - 1. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.5 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: 0.035-inchthick, satin-finished, Type 302 stainless steel with color as specified by the Architect.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.6 FINISHES

- A. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
 - 2. Wiring Devices Connected to Emergency Power System: Red.
- B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.

2. Verify that dimmers used for lighting control are suitable for the light fixtures they will be connected to.
 3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

- A. Comply with specifications for "Identification for Electrical Systems" in Section 260050.
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

- A. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- B. Wiring device will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following individually mounted, enclosed switches and circuit breakers:
 - 1. Fusible switches.
 - 2. Molded-case circuit breakers for installation in existing panels.

1.3 DEFINITIONS

- A. GD: General duty.
- B. GFCI: Ground-fault circuit interrupter.
- C. HD: Heavy duty.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current rating.
 - 4. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- B. Shop Drawings: Diagram power, signal, and control wiring.

- C. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Project Closeout" include the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - 2. Time-current curves, including selectable ranges for each type of circuit breaker.

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. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

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.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

- A. Available Manufacturers:
 - 1. Eaton Corporation; Cutler-Hammer Products.
 - 2. Square D/Group Schneider.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Or approved equal in accordance with the project substitution provisions of the contract.
- B. Fusible Switch, 600 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.

2.3 MOLDED-CASE CIRCUIT BREAKERS FOR INSTALLATION IN EXISTING PANELS

- A. Manufacturers: Provide units compatible with the existing panel in which installed.
- B. 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. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Lugs: Mechanical style with compression lug kits suitable for number, size, trip ratings, and conductor material.
 4. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

2.4 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches.
- B. Mount individual wall-mounting switches with tops at uniform height, unless otherwise indicated.

- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "260120 Conductors and Cables."
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "260050 Basic Electrical Materials and Methods."

3.4 FIELD QUALITY CONTROL

- A. Prepare for acceptance testing as follows:
 - 1. Inspect mechanical and electrical connections.
 - 2. Verify switch and relay type and labeling verification.
 - 3. Verify rating of installed fuses.
 - 4. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Exclude electrical test in 7.5. Exclude the following NETA ATS (1999) items for breakers with trip settings of 400A or less: 7.6.1.1.2.5; 7.6.1.1.2.6; 7.6.1.1.2.7; 7.6.1.1.2.8; 7.6.1.1.2.9. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

- A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.
- B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 262816

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, general provisions of the Contract, include General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior lighting fixtures.
 - 2. Exit signs.
 - 3. Lighting fixture supports.
 - 4. Where possible, provide DLC listed light fixtures for this project of a type equal to the fixtures listed in this specification.

1.3 DEFINITIONS

- A. CRI: Color-rendering index.
- B. CU: Coefficient of utilization.
- C. LER: Luminaire efficacy rating.
- D. Luminaire: Complete lighting fixture, including ballast housing if provided.
- E. RCR: Room cavity ratio.

1.4 SUBMITTALS

- A. LED Light Fixture 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. Include confirmation that the light fixtures being provided are either DLC listed or confirmation that a DLC listed fixture is not obtainable for the light fixture.
 - 3. The shop drawing shall include the “L70 Rating” for each light fixture, indicating compliance with a minimum L70 of 50,000 hours.

4. The shop drawing shall indicate, for exterior light fixtures, a rated ambient temperature of 15 degrees-C or lower.
 5. The shop drawing shall include photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for fixtures identical to those required for this project.
 6. The shop drawing shall include, for each fixture, the rated driver current, indicating compliance with a maximum value of 2 mA.
 7. The shop drawing shall indicate the minimum delivered lumens indicating compliance with the minimum value listed in the light fixture schedule.
 8. The shop drawing shall indicate the CRI = Color Rendering Index of the light fixture indicating compliance with the CRI value listed in the light fixture schedule.
 9. Shop drawings that do not include each of the above light fixture ratings shall be rejected.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
- D. Warranties: Special warranties specified in this Section.

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. Comply with NFPA 70.

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.
- B. The light fixture catalog number indicated on the project documents is to establish the intent of design but does not necessarily include all required accessories and hardware for a complete installation. Prior to shop drawing submission and fixture purchase, coordinate the final requirements for each light fixture with ceiling construction and finish types as required by the Professional and/or the Institution. Coordination to include but not be

limited to: ceiling type; supporting methods & hardware; trim; accessories; fixture finish and color. Submission of bid indicates inclusion of all material and installation as required by these coordination requirements.

1.7 WARRANTY

- A. LED light fixtures provided as a part of this project shall be provided with a 5 year warranty.

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. Basis-of-Design Product: The design for each lighting fixture is based on the product named in the Lighting Fixture Schedule shown on drawings. Subject to compliance with requirements, provide either the named product, a comparable product by one of the other manufacturers specified, or an approved equal.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts: Free of burrs and sharp corners and edges.
- C. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.
- E. 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.

F. Plastic Diffusers, Covers, 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 minimum unless different thickness is indicated.
 - b. UV stabilized.
2. Glass: Annealed crystal glass, unless otherwise indicated.

2.2 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, 70,000 hours minimum rated lamp life.
 2. See drawing light fixture schedule for requirements.

2.3 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- B. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- C. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.4 REQUIREMENTS FOR INDIVIDUAL LIGHTING FIXTURES

- A. Fixtures Characteristics: As shown on Lighting Fixture Schedule.

2.5 LED LIGHT FIXTURES

- A. LED light fixtures provided as a part of this project shall have a minimum L70 rated life of 50,000 hours. The shop drawing submitted for these fixtures shall include this information.
- B. The maximum driver current for each fixture shall not exceed 2mA.
- C. The power factor of the load for each light fixture shall not exceed a value to cause a 60% loaded 277V light fixture branch circuit to have a power factor less than 0.85.
- D. The LED fixtures shall be provided with the special warranty listed in this specification.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as the primary support element.
 - 1. Install a minimum of four ceiling support system rods or wires for each fixture from the building structure to tabs on the light fixture located not more than 6 inches from the light fixture corner. The wire or rod shall have a breaking strength of the weight of the fixture at a safety factor of 3.
 - 2. 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.
 - 3. 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.
- C. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem

- hangers.
- 3. 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.
- D. Adjust aimable lighting fixtures to provide required light intensities.
- E. Connect wiring according to Division 26 Section "Low Voltage Electrical Power Conductors and Cables."

3.2 **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 265119

SECTION 271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Category 6a twisted pair cable.
 - 2. Twisted pair cable hardware, including plugs and jacks.
 - 3. Cable management systems.
 - 4. Patch Panels.
 - 5. Cabling identification products.
 - 6. Grounding provisions for twisted pair cable.
 - 7. Source quality control requirements for twisted pair cable.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. Jack: Also commonly called an "outlet," it is the fixed, female connector.
- C. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.
- D. RCDD: Registered Communications Distribution Designer.
- E. UTP: Unscreened (unshielded) twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Twisted pair cable testing plan.
- C. Provide results of test data to the Design professional after testing has been completed.
- D. Product Certificates: For each type of product.
- E. Source quality-control reports.

- F. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test each pair of twisted pair cable for open and short circuits.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with the Institution's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with and be tested to confirm that transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.
- B. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:
 - 1. Communications Plenum Rated: Type CMP complying with UL 1685.

- B. Surface-Burning Characteristics: Comply with ASTM E84; testing 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: 450 or less.
- C. RoHS compliant.

2.3 CATEGORY 6a TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6a cable at frequencies up to 500MHz.
- B. Standard: Comply with TIA-568-C.2 for Category 6a cables.
- C. Conductors: 100-ohm, 23 AWG solid copper.
- D. Shielding/Screening: Unshielded twisted pairs (UTP).
- E. Cable Rating: Plenum.
- F. Jacket: Blue thermoplastic.

2.4 TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- B. General Requirements for Twisted Pair Cable Hardware:
 - 1. Comply with the performance requirements of Category 6a.
 - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 - 3. Cables shall be terminated with connecting hardware of same category or higher.
- C. Source Limitations: Obtain twisted pair cable hardware from single source from single manufacturer.
- D. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
 - 1. Features:
 - a. Universal T568A and T568B wiring labels.
 - b. Labeling areas adjacent to conductors.
 - c. Replaceable connectors.
 - d. 24 or 48 ports.
 - 2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.

3. Number of Jacks per Field: One for each four-pair cable indicated, plus spares and blank positions adequate to suit specified expansion criteria.

E. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.
3. Marked to indicate transmission performance.

F. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.
4. Marked to indicate transmission performance.

G. Faceplate:

1. Faceplates designed to mount to single gang wall boxes.
2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
3. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
 - a. Flush mounting jacks, positioning the cord at a 45-degree angle.

H. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 GROUNDING

- A. Comply with requirements in Section 260526.
- B. Comply with TIA-607-B.

2.7 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.

- B. Factory test cables on reels according to TIA-568-C.1.
- C. Factory test twisted pair cables according to TIA-568-C.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports and submit them to the engineer as a shop drawing submittal.

PART 3 - EXECUTION

3.1 WIRING METHODS

- A. Wiring Method: Install cables in raceways (where concealed in walls), except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, 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.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Provide J-Hooks and cable support rings for cable support between the rooms and the electrical/data closet above dropped ceilings that are rated for use with Cat-6a cables.
- D. 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. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

- A. Comply with NECA 1 and NECA/BICSI 568.
- B. General Requirements for Cabling:
 - 1. Provide patch panels for termination in the electrical/data closet.
 - 2. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
 - 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 4. 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.
 - 5. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.

6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
7. 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.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
9. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend twisted pair cabling, 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.

D. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper 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, 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.

3.3 FIRESTOPPING

- A. Comply with the "Penetration Firestopping" requirements in the specifications.
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with "Firestopping Systems" Article in BICSI's "Telecommunications Distribution Methods Manual."

3.4 GROUNDING

- A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."
- B. Comply with TIA-607-B and NECA/BICSI-607.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.5 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B.
- B. 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.
- C. 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 the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. 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, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
 - b. Label each unit and field within distribution racks and frames.
4. 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.
- D. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:
1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections with the assistance of a factory-authorized service representative.
- D. Tests and Inspections:
1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.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.
- E. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

- F. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- G. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- H. Prepare test and inspection reports.

END OF SECTION 271513